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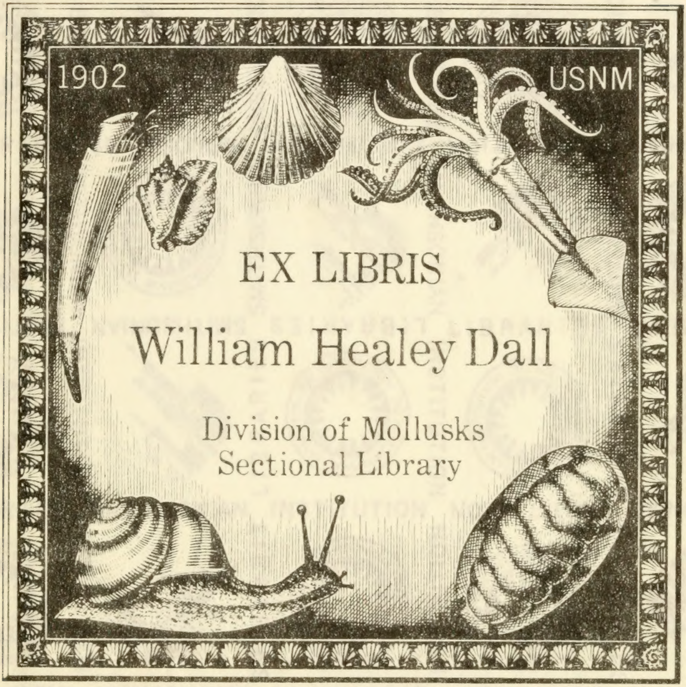

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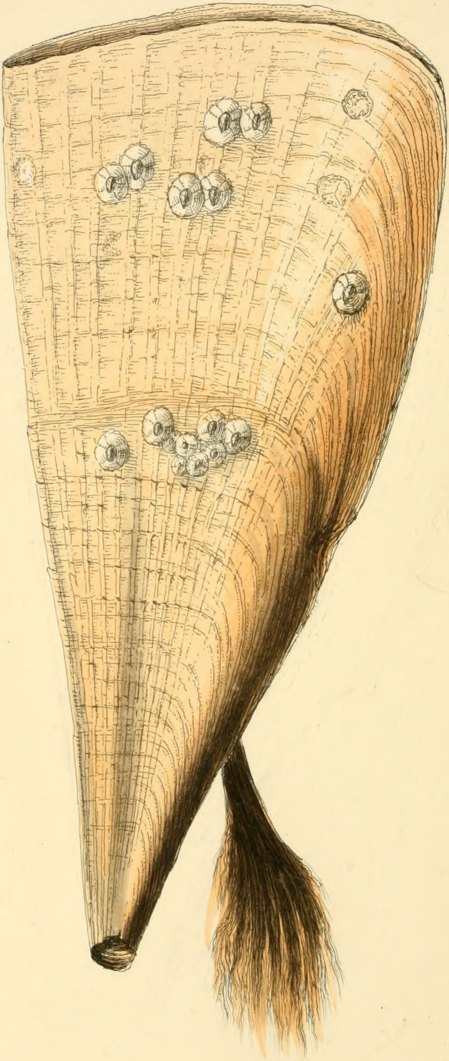

Pinna rudis.

Published by J. Van Voorst. 1863.

W. Sowerb

BRITISH CONCHOLOGY,

OR AN ACCOUNT OF

THE MOLLUSCA

WHICH NOW INHABIT THE BRITISH ISLES AND THE
SURROUNDING SEAS.

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VOLUME II.

MARINE SHELLS,

COMPRISING THE BRACHIOPODA,
AND CONCHIFERA FROM THE FAMILY OF ANOMIIDÆ
TO THAT OF MACTRIDÆ.

BY JOHN GWYN JEFFREYS, F.R.S., F.G.S., &c.

LONDON:
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INTRODUCTION.

Since the publication of the first volume of this work I have made two more dredging-excursions to the Shetland Isles, a district which is by far the most interesting that I know of for the further investigation of the British Mollusca. In the interval I revisited the South of France, and also went to the Hanse towns, Denmark, Sweden, and Norway, for the express purpose of examining public and private collections of European shells, and especially the types of species described by O. F. Müller and subsequent writers on Scandinavian conchology. Every naturalist will appreciate the advantage of such an undertaking, being aware that our own fauna or flora cannot be properly studied apart from that of the rest of Europe. These preliminary remarks are offered to explain the cause of delay in the appearance of the present volume, and likewise to express my grateful acknowledgments for the kind welcome and aid which I received from all the leading zoologists in the countries above mentioned. Nor ought I to omit a renewal of my thanks to many of my own countrymen, who have again most liberally placed their collections at my disposal and favoured me with valuable communications. I will now endeavour to profit by the opportunities I have thus enjoyed, in extending the list of our native Testacea, as well as in revising the synonymy and defining the range of previously known species.

And here let me say a few words about the adoption of names, whether of genera or species. I would premise by stating that I am averse to unnecessary innovation. All names which have been generally used, and which may therefore be said to be established or familiar, ought never to be changed, except for the strongest reasons. To substitute new names for these would be manifestly inexpedient and lead to much confusion. Even the ground of priority is in most cases no excuse for altering and unsettling the accepted nomenclature; and the attempt to revive old, obscure, and long-forgotten names cannot be too strongly deprecated. It is forbidden to disturb the ashes of the dead. But no task is more difficult to the naturalist, or more open to criticism, than the selection of names, where more than one are still used by different authors for the same genus or species. He has to perform the functions of both judge and jury, and not only to weigh carefully the evidence for and against the retention of any name thus put upon its trial, but also to administer strict and impartial justice, according to the laws of scientific terminology. Besides, it must not be forgotten that the nomenclature used by scientific men in other countries, where many branches of natural history are cultivated not less assiduously or successfully than in Great Britain, does not altogether agree with ours. The utmost pains ought to be taken to reconcile or lessen the difference between us and them in this respect, so as to ensure as much uniformity as possible. Naturalists of all countries are members of the great commonwealth of science, and their technical language is the same. Our patriotic feelings, although commendable in other matters, ought to give place to the higher object of serving the general cause, while investigating the works of the Creator.

The favourable reception given to the preceding volume has encouraged me to persevere in the attempt to make this work readable by all, and at the same time useful to my brother conchologists. The advice of our old friend, Horace, should not be neglected by any writer:

> Omne tulit punctum, qui miscuit utile dulci
> Lectorem delectando pariterque monendo.

All that relates to Nature is in itself so delightful, and the pursuit of it elicits so many of our best and truest feelings, that every undertaking of this kind ought to be imbued with the sentiment inculcated by the above maxim, instead of repelling students by too much technicality. The author and his readers have a joint property in the subject-matter, and they are held together by the same tie of sympathy.

> . . . . . "Pleasure is spread through the earth
> In stray gifts to be claimed by whoever shall find."

Our communion with GOD, through His works, affords one of the purest and most unalloyed of pleasures that is permitted to us in this transitory state. Even the mere contemplation of them, in any of their various aspects, if it is made in a fitting mood, assures us, much more forcibly than human teaching can, that our minds —our spirits—our souls partake of His eternity and are imperishable. This idea has pervaded all men and in every age. It is innate and ineradicable.

At the same time it cannot be denied that novels, magazines, and newspapers constitute now-a-days the literature which chiefly occupies the small reading-time of the public, and that scientific books generally are overlooked, unless they advance some startling proposition as to the origin or remote antiquity of our own race. There can be no use, however, in blaming the popular taste; nor would it be reasonable to expect that every one should follow a scientific path, if his inclinations do not lead him that way. The love of Nature is not confined to any one period, and its votaries must not feel disappointed, should their peculiar studies not be shared by all their contemporaries.

Before entering into the details of our marine Mollusca, I would make a few more remarks as to their distribution and structure. This I was prevented from doing in the introductory part of the former volume by an anxiety not to impose too long an exordium on the patience of my readers.

The sea-bed may be said, in the technical language of lawyers, to be "land covered with water." Its outline, if it could be viewed through an aquatic telescope, would be seen to be irregular, and nearly as much diversified as the surface of the earth. Mountains, hills, rocks, gorges, valleys, and plains would be successively exhibited in the submarine panorama, having often the same bold and abrupt contour that gives so picturesque an aspect to land scenery. Oceanic and tidal currents represent rivers, corresponding with them in volume and rapidity, and equally scooping out channels of various degrees of width and depth. But we have good reason to believe that lifeless deserts, like the great Sahara, are wanting below the broad watery girdle which encircles the globe and covers at least three-fourths of its extent. It is true that, in certain inlets or arms of the sea, rivers flowing into them may have sufficient strength and velocity to sweep the middle of the channel, and thus prevent the deposit of mud or other sediment which would afford the necessary shelter or food to certain animals. Indeed the continual motion of the stream and the destructive property of fresh water might preclude the possibility of any marine animals existing within the prohibited area; and in that case the central bed of the channel would be partially covered with clear sand, devoid of organic remains. An instance of this kind has been given by Dr. Wallich in his account of Hamilton's Inlet, Labrador *. Such cases, however, are exceptional; and the limits of these areas are very circumscribed. Many kinds of Invertebrata are known to flourish in the most rapid tideways, and even in whirlpools; and the water of the ocean everywhere teems with life. The dredge has never failed to bring up some organisms from every part of the sea-bed which has been hitherto explored. However unpromising it may at first sight appear, the cleanest-looking sand taken from any depth of water, and carefully examined by the aid of a lens or microscope, will be found to contain structural forms. Having these facts and a certain degree of experience to guide us in the inquiry, it would be a hasty assumption that any geological strata of comparatively recent formation, which do not contain fossils, are of marine origin. Whether the absence of fossils from particular strata may be attributable to chemical absorption or decomposition is a question which must be decided on other grounds. Let Mr. Sorby be the exponent. Until more is known of this difficult and interesting subject, we may suspend our judgment as to any formation being either azoic or protozoic. The presence of scarcely more distinct traces of life than a few worm-casts in our lowest Silurian rocks does not prove the improbability, much less the impos-

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* 'The North-Atlantic Sea-bed,' p. 49.

sibility, of many other and more perfect structures having been formed elsewhere at the same early period of the world's history. The maxim "de non apparentibus et non existentibus eadem est ratio" is scarcely applicable to geological cases of this nature.

The conditions which exist in one part of the sea-bed are often quite different in another part. The late Professor Forbes, in his valuable Report to the British Association in 1843 on the Invertebrata of the Ægean, stated his belief that the zero of animal life was probably about 300 fathoms, because his dredgings in that sea at a depth of 230 fathoms yielded but very few species. But in other tracts of the ocean living animals of various kinds have been repeatedly obtained from far greater depths. Our knowledge of abyssal life is only checked by the difficulty of such explorations and by the imperfect nature of our means of discovery. It is a high and worthy object of the naturalist's ambition, and by no means devoid of general interest.

> "There is a magnet-like attraction in
> These waters to the imaginative power
> That links the viewless with the visible,
> And pictures things unseen."

Speculations of this kind were not unknown to the ancients. In the 'Halieutica' of Oppian, written nearly seventeen centuries ago, it is stated that no one had found the bottom of the sea; and that the greatest depth ascertained by man was 300 fathoms, where Amphitrite had been seen. But this grand discovery does not seem to have satisfied the poetical philosopher, and he enters into a long disquisition as to the many other wonderful things that may be concealed in the recesses of the boundless ocean—adding, however,

> ". . . . . ὀλίγος δὲ νόος μερόπεσσι καὶ ἀλκή."

Torell and Wallich, fortunately for science, were regardless of the consequences which, according to M. Michelet (in his charming rhapsody of "La Mer"), would ensue on their "curiosité sacrilège;" and, with anxious gaze "eyeing the sea's blue depths," they have dared to cross its mysterious threshold. To one of these enterprising philosophers is perhaps reserved the privilege of announcing, in the words of the poet,

> . . . . "Lo! the polar seas
> Unbosom their last mysteries."

The glimpses which they succeeded in obtaining were few and transient; but we now know that the great ocean-depths are inhabited by a variety as well as an abundance of living animals, some of which are of no mean rank in the scale of classification. Wordsworth was not wrong in his divination when he also said,

> "Her procreant vigils Nature keeps
> Amid the unfathomable deeps."

I have lately had, through the kindness of Dr. Wallich, an opportunity of examining some of the material brought up in his North-Atlantic soundings. One of these yielded several dead shells of Mollusca, as well as *Globigerinæ* and other Foraminifera, from the extraordinary depth of 1622 fathoms, or nearly two miles! This sounding was taken in lat. 55° 36′ N., long. 54° 33′ W., and about 100 miles N.W. of Hamilton's Inlet. *Crenella faba*, one of the species of Mollusca thus obtained, was dredged by Dr. Wallich on the adjacent coast, at a depth of from 18 to 40 fathoms only; and it is not uncommon on the shores of the Polar and Arctic seas. The other species of Mollusca inhabit deep water; and one is undescribed. It may be conjectured that these shells were dropped from the bottom of a melting iceberg on its passage to the south; but as icebergs take up only stones and earth from the land, like the moraine of a glacier, such a conjecture does not seem to be entitled to much weight. An iceberg might certainly be stranded, and thus pick up shells; but it would in all probability be dissolved on the spot in the course of time. Its bulk and weight are too great to admit of its floating off again under such circumstances as I have supposed. It is, indeed, within the bounds of possibility that the shells might have been collected on the shore by coast-ice, and carried off to sea; but Dr. Wallich informs me that this kind of ice has never been known to travel so far southward as the locality above mentioned. There is much greater probability that the mollusca in question lived and died on the sea-bottom where their remains were found. Every one who considers the importance of these researches ought to read and study Wallich's treatise on the North-Atlantic Sea-bed, and especially the chapter on the bathymetrical limits of animal life in the ocean. He will find the subject treated in a philosophical and masterly style; and the account of living starfishes having been discovered at a depth of 1260 fathoms in the open sea, and also the geological application of that discovery, especially deserve attention. Until of late years the use of the dredge, as an instrument of zoological research, was nearly unknown. All that naturalists did in former times was to examine the refuse of trawl nets, which seldom reached a depth of 20 fathoms; or now and then fishing-lines of more than twice that length brought to the surface a few shells and corals which were accidentally detached from the bottom of the sea. These specimens (as Professor Forbes said) "only served to whet our curiosity, without affording the information we thirsted for." Now-a-days, however, the dredge is a scientific necessity; and scarcely any part of the ocean, from one pole to another, has been exempt from its operations.

The level of the earth everywhere is continually changing. That of the sea is, on the contrary, fixed; and although we are accustomed to speak of its advancing and retiring, the only motion it has of this kind is occasioned by the tides, and is never permanent. Sea and earth may be compared to two sisters, the elder one staid and sedate, the younger giddy and fickle. The solidity of the earth and capriciousness of the sea are poetical terms, but incorrect in a geological point of view. Poetry and Geology have seldom much in common. It is a striking fact, that every part of the earth's surface which is now habitable or dry, has at more periods than one formed the bed of the sea:

> "Each changing place with that which goes before,
> In sequent toil all forwards do contend."

There is not an individual particle of this crust but what has been often shifted and transformed; and the phases of a kaleidoscope are not more varied than the configurations which have resulted from such changes since time commenced its task of revolution. The inevitable recurrence of similar fluctuations will assuredly make our rich and favoured isle again the seat of watery wealth—although it may not be laid waste by a deluge such as Horace describes,

> "Omne quum Proteus pecus egit altos
> Visere montes,
> Piscium et summâ genus hæsit ulmo,
> Nota quæ sedes fuerat columbis,
> Et superjecto pavidæ natarunt
> Æquore damæ."

Not long afterwards Manilius (who was a better geologist than Horace) showed the reverse of the medal:—

> "Emersere fretis montes, orbisque per undas
> Exiliit, vasto clausus tamen undique ponto."

Such theories appear to have been first propounded by Straton, the successor of Theophrastus in his school; and they were improved by Herodotus, and still more by Strabo, who gave numerous instances of the changes of sea and land. But it is not a mere theory, that what has been will be; and our own Shakespeare has prophetically illustrated this idea in one of his exquisite sonnets:—

> "When I have seen the hungry ocean gain
> Advantage on the kingdom of the shore,
> And the firm soil win of the wat'ry main,
> Increasing store with loss, and loss with store;
> When I have seen such interchange of state,
> Or state itself confounded to decay;
> Ruin hath taught me thus to ruminate—
> That time will come"—

Sea and land are in some respects convertible terms; and the epithet of "earth-embracing," given to the former, conveys only an indistinct notion of their close and inseparable union. One cannot exist without the other. They contain many of the same ingredients. But the sea is the main depository of all soluble matter; and the greater number and bulk* of marine testacea, compared with those which inhabit the land, may be thus accounted for. The quantity of calcareous matter from which the continual and immense construction of shells is derived, appears to be infinitesimally small. Liebig has calculated that sea-water contains only $\frac{1}{12,400}$ of its weight of carbonate of lime, this being the principal ingredient of molluscous shells. How little do we appreciate the action and effect of elements which are insignificant in themselves but inconceivably important in their consequences!—a consideration which is not less applicable to moral than to physical nature. Paley in his 'Natural Theology' quaintly remarks, with regard to the proportion of space occupied by the sea and land, "I know not why the sea may not have as good a right to its place as the land." No more do I. Each unconsciously fulfils the peculiar function assigned to it from the commencement by an allwise Providence. No one can reflect on the innumerable and various transformations which both have since undergone, without being convinced that their creation and inherent forces must be due to an extraneous cause. Paley's watch is out of fashion; but those of my readers who admire—and who does not?—the still more antiquated but equally devout writings of the "Father of English Poets" will, I feel sure, not object to be reminded of his sentiments on the same topic. They are in the Prologue to his 'Testament of Love,' and as follows:—

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* I have seen a specimen of *Tridacna gigas*, from Amboyna, said to weigh 3 cwt. 3 qrs.

"Nowe principally the mene to brynge in knowleging and lovynge his creatour, is the consideracyon of thynges made by the creatour, wher through by thylke thinges that ben made, understandynge here to our wyttes, arne the unsene pryvities of God made to us syghtfull and knowinge, in our contemplacion and understondinge. These thinges than forsoth moche bringen us to the ful knowleginge sothe, and to the parfyte love of the maker of hevenly thynges. . . . . . it is a grete likynge in love of knowinge ther cretoure: and also in knowinge of causes in kindelye thynges, considrid forsothe the formes of kindelye thinges and the shap, a gret kyndely love we shulde have to the werkman that 'hem made. The crafte of a werkman is shewed in the werk."

Who that breathes, and is endued with the powers that so widely separate man from the brute, can for one instant withhold his acknowledgment of an omnipresent Being, which is sensibly spread

. . . . "o'er all that glides
Beneath the wave, yea, in the wave itself,
And mighty depth of waters"?

I will now resume the special purpose of this work, commencing with the Brachiopoda, as having the lowest organization, and advancing upwards to the higher or more perfect Mollusca. The descriptions of the animals or soft parts will, I regret to say, be sometimes scanty and occasionally wanting. They are principally taken from the observations of the late Mr. Clark and Professor Forbes, Mr. Alder, and myself. My deficiencies in this respect will, I trust, stimulate other naturalists to supply the desired information; and I would especially invite the assistance of those who have an aquarium, and opportunities of keeping it supplied from the various parts of our extensive seaboard. Every fact, however trivial, is worth recording, because (even if it is not new) it may be useful for the sake of confirming the accounts given by other naturalists. Most of the illustrations of molluscous animals in this volume have been copied from the plates in Forbes and Hanley's work, or engraved from original drawings by Mr. Alder. For the figures of *Crania, Crenella,* and *Cyamium* I am indebted to Dr. Saxby, and for that of *Pinna* to Mr. Spence Bate.

The 1st Class, or Conchifera, has been described in the first volume, so far as it relates to the freshwater Mollusca; and the only other division of the Acephala is the Brachiopoda, which will now be noticed.

Class BRACHIÓPODA*.

Body compressed, of an oval or occasionally a circular form, contained within the two valves of a shell, which are in most cases connected behind by a hinge, but never by a ligament or cartilage. The shell is inequivalve, and furnished inside with a complicated skeleton for supporting the arms, which will be presently noticed. The mantle is divided into two lobes, and its outer edge is fringed with a row of extensile tentacles, every one of which has at its root or base a coloured spot, which may be a rudimentary eye. Each lobe contains a folded or spirally coiled arm, which is furnished with one or more rows of flexible cirri or filaments. The animal is destitute of a head or foot; but it has a slit-shaped mouth behind the arms, an excretory tube, a stomach, several vesicles which serve the purpose of a heart, nerves, muscles, liver, and reproductive organs. The circulatory system is supplied by the mantle and arms, there being no gills. It is supposed by some writers that both sexes are united in the same individual; but this is doubtful. In the majority of cases (e. g. *Terebratulidæ*) the animal is attached to extraneous bodies by a fibrous stalk or peduncle, which is placed at the back, and penetrates the upper or convex valve; while in others (e. g. *Craniidæ*) it is usually affixed by the outer surface of the lower valve, which is flat.

This remarkable and peculiar Class is nearly equal in value to the Conchifera (see vol. i.) as regards the importance of its structural characters; and, although it does not contain so many species, they are quite as abounding in individuals. In point of antiquity it is far superior,

> " . . . . . . of ancestry
> Mysteriously remote and high;"

and not even a Welshman, who would place Adam in the middle of his genealogical tree, can boast such a

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[*] From an erroneous notion that their feet take the shape of arms.

lineage. The *Lingula*-bed of the upper Cambrian system is well known; and other palæozoic strata contain equally rich mines of similar wealth. But although the number and variety of recent Brachiopoda are not equal to those of former days, the difference does not appear to be so great as has been usually represented. Mr. Davidson, who is perhaps the greatest authority on the subject, says that there are 20 Silurian, 25 Devonian, 19 Carboniferous, 12 Permian, 12 Triassic, 14 Jurassic, 12 Cretaceous, 10 Tertiary, and 14 recent genera and subgenera; so that we seem to have improved in this respect on the middle ages, and future generations may exhibit a further advance, and even rival the primeval era. The comparative rarity of Brachiopoda in modern times may be easily accounted for. They mostly inhabit rocky and stony parts of the sea-bed, which cannot be reached by the dredge without great risk of its being lost or injured, although they are gregarious and occur in vast numbers under favourable circumstances. My late friend, Dr. Lukis, found more than 200 specimens of *Argiope cistellula* on a single stone brought up from a depth of 20 fathoms off Guernsey; and I have myself repeatedly taken *Terebratula caput-serpentis* and *Crania anomala* in such profusion on the western coasts of Scotland, as to be compelled by a sheer *embarras des richesses* to throw many hundreds overboard in the course of a day's dredging. Even the comparatively rare *T. cranium* is no exception. I have counted seventy specimens, although broken and imperfect, which came up in a single haul off the Shetlands. *Terebratella Spitzbergensis*, which was at first accounted extremely scarce, now appears, from Dr. Otto Torell's researches, to be by no means uncommon in its native haunts; and I lately picked up two or three fossil

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specimens of it at Uddevalla, in the course of a short exploration of the raised sea-bed in that remarkably interesting place. *T. septata* (or *septigera*), as regards the frequency of its occurrence, may be placed in the same category. The examination of fossiliferous strata is attended with no risk, and the specimens are procured without much difficulty; but I much doubt if we should not find in a modern sea-bed, of the same extent and having similar conditions, a collection of Brachiopoda fully equal in number and variety to those contained in any one Palæozoic, Mesozoic, or Cainozoic formation. So many recent species have been made out of solitary or a very few specimens, that it is evident much remains to be known of this curious group as it at present exists. Being individually numerous, and comparatively low in the scale of organization, the tendency to variation is of course great. An examination of nearly all the types of recent species induces me to suggest the necessity of a complete revision of these so-called species.

This group has been for more than half a century a favourite study of naturalists. Pallas, Cuvier, De Blainville, Owen, Quenstedt, Deshayes, Vogt, Forbes, Huxley, M. J. Müller, Schmidt, Deslongchamps, Carpenter, Barrett, Woodward, Gratiolet, Hancock, F. Müller, Macdonald, Lacaze-Duthiers, and Shaler have at different periods contributed a vast store of information as to the structure of recent Brachiopoda; while De Koninck, D'Orbigny, M'Coy, King, Davidson, Suess, and other able palæontologists have made us acquainted with the fossil forms. Mr. Reeve has also rendered some good service in respect of the synonymy and geographical distribution of existing species. Mr. Hancock's valuable paper "on the Organization of the *Brachiopoda*" will be found in the 'Philosophical Transactions' for 1858.

It deservedly gained him the Royal medal, and is the more praiseworthy because he never, I believe, had the good fortune to see a living specimen. This opportunity, however, has frequently occurred to me; and I will endeavour, with the aid of Mr. Hancock's and other treatises, to present a few remarks on the structure and habits of this extraordinary class.

It has been usual to consider the valves of the shell in *Terebratula* as covering the front and back of the animal, the perforate valve being ventral, and the imperforate valve dorsal. When the *Terebratula* is attached by its peduncle the perforate valve is uppermost. But the analogy between the Brachiopoda and the Vertebrata is very slight. The back of a *Terebratula* is really that part which lies behind the arms and mouth, and is close to the apex or point of attachment. Instead, therefore, of calling the valves "ventral" and "dorsal," it would seem more correct to describe them as "upper" and "lower"—the larger and deeper valve being perforate and uppermost, and the smaller and shallower valve being imperforate and lowermost. In the Brachiopoda the valves are articulated *across* the back; in the Conchifera the valves are united by a ligament or cartilage *along* the back. The arms occupy two-thirds of the shell. They resemble the mainspring of a watch, and are not capable of being protruded or unrolled. I have never observed the cirri, with which they are clothed, to project much beyond the edges of the shell in the living animal. The great extent of these brachial organs is very remarkable. In *Rhynchonella psittacea* the arms, when forcibly stretched out, are said to be more than four times the length of the shell, and to support about 3000 cirri. In *Terebratula caput-serpentis* the cirri open and fold together somewhat like a butterfly-net.

Mr. Hancock is of opinion that "the brachial organs subserve the function of gills, as well as that of respiration." As far as I could judge from the examination of living specimens of *T. caput-serpentis*, the inner folds of the mantle appeared to have the same action as that of the gills in many Lamellibranch Mollusca. The name of *Palliobranchiata* was given to the class now under consideration in consequence of a belief that their respiratory system was dependent on the mantle. Mr. Macdonald has shown, in the 'Linnean Transactions' (xxiii. p. 375), that the pallial sinuses serve as organs of circulation. Some of this class have calcareous spicula or plates in the mantle, as well as in the arms and cirri. In *Terebratula caput-serpentis* these spicula are very numerous, large, and often branched like the antlers of a deer; and they form an extensive though incomplete network. Their use is doubtless the same as that of the spicula in sponges, viz. to strengthen and support the tissues of the animal, and especially to protect the delicate canals of the mantle from the pressure of the external fluid. Under a microscope with polarized light these spicula are remarkably beautiful objects. The pallial tentacles resemble those of *Anomia*. When the animal is dead and dried up, they are stiff from contraction, and of a horny texture, for which reason they have been called setæ or bristles. The muscular system is well developed, and admirably adapted to the complicated machinery by which the animal opens, closes, and moves the valves of its shell. Dr. Carpenter was the first to point out and explain a very singular apparatus of canals or cylindrical holes observable in the shells of *Terebratula* and other allied genera, which are occupied by tubular appendages of the mantle and closed on the outside. These processes penetrate every part of the shell, but their function has not been satisfactorily made out. Mr. Hancock supposes that they maintain the vitality of the shell, and that perhaps by their means any injury to it may be repaired. Some provision of this sort appears to be necessary, because the Brachiopods do not, to any great extent, thicken their shells by successive internal layers, like bivalve Mollusca. The shells of the Brachiopoda are never provided with an epidermis; and this may also account for their perforated structure. Many bivalve shells, such as those of *Astarte,* from which the epidermis has been accidentally removed, peel off, or become eroded near the beaks to such an extent that, if new layers were not continually being secreted from within, the animals would be laid bare and exposed to untold dangers. Sponges, *Balani, Serpulæ,* and other extraneous organisms are often seen covering or attached to the shells of *Terebratulæ.* The hinge in the articulated kinds is so firmly interlocked, that it is impossible to separate the valves without using a slight degree of force. They appear to be in some measure sensible of light. Lacaze-Duthiers gives an instance of *Thecidia* collapsing suddenly when his shadow passed between them and the sun. He succeeded in keeping these curious Brachiopods, in a lively and active state, for six weeks by merely changing the water every day. The sexual nature of the Brachiopoda is not quite determined. Dr. Gratiolet suggests that the same individuals may become successively male or female at different periods. Mr. Hancock considers *Lingula,* at least, to be androgynous or monœcious; and he infers from analogy that both sexes are combined also in the articulated Brachiopods. But Lacaze-Duthiers has investigated this part of the subject more recently and under circumstances more favourable than seem to have fallen to the lot of any other writer. His elaborate essay on the *Thecidium Mediterraneum* will be found in the 'Annales des Sciences Naturelles' for 1861, and is the first of a series of monographs on the organization of the living Brachiopoda. He asserts most confidently that the *Thecidia* are of different sexes, and that the male and female can be distinguished even by their shells. According to his observations the embryo of *Thecidium* is divided into four distinct lobes, and it has sometimes two, and at other times four eye-spots. When separated from the peduncle by which it is attached, it swims or whirls head foremost by means of vibratory cilia which cover the body. Fritz Müller had previously described in Wiegmann's Archiv (xxvii. p. 53) the fry of a Brazilian Brachiopod. He says it was enclosed in a bivalve shell like the adult, and that its structure was the same, except in having two eyes and in wanting the reproductive and circulatory organs. The arms were covered with a complete coat of cilia, by the action of which the little creature swam. It could also creep; and this was effected by a semirotatory movement alternately to the right and left, and by pushing itself along by means of the bristles or setæ which fringe the edges of the mantle, and upon the strongest of which it would occasionally support itself while resting. The Brachiopoda are extremely prolific, and their countless eggs are of a spherical shape. After quitting the embryonic state, they become invariably and permanently fixed to other substances, being incapable of any other motion than making a half-turn round the peduncle or pivot. Their food consists of Infusoria or other minute organisms. Milton has, with his usual felicity, described the present animals as those which,

> ". . . . . in their pearly shells at ease, attend
> Moist nutriment."

Some *Terebratulæ* which I watched for a long time seemed, however, to be more active than passive in feeding. They were incessantly opening and folding their cirrous arms, and drawing or sucking in, by means of the whirlpool thus caused, every animalcule within its influence. The action reminded me of that of a Barnacle, the only difference being in the position of the arms, which in *Balanus* are placed in front, and in *Terebratula* on the sides of the animal. Possibly Cuvier's notion that the Brachiopods do not differ much from the Cirripeds was correct, although the relationship between them may be one of analogy rather than of affinity. Very lately Dr. Gratiolet has expressed an opinion that the Brachiopods are allied to the Crustacea in respect of their vascular system, and not to the Mollusca, or least of all to the Tunicata. Milne-Edwards has included them with the Tunicata and Polyzoa, in his Class "Molluscoida." Lacaze-Duthiers separates them from the Acephala mainly on embryogenic grounds, remarking that the difference in this respect between the Brachiopoda and Acephala is as great as between the latter and the Gasteropoda. In this controverted and unsatisfactory state of our knowledge, it would seem best to retain them for the present in the great kingdom of the Mollusca, as a class of coordinate value with the Conchifera,—the Pteropoda and Gasteropoda forming another and equally poised group. The Brachiopoda have certainly some features in common with the Tunicata, as well as with the Conchifera; but they differ essentially from both in having cirrous arms, in which latter respect they resemble the Cirripedia. The perforated structure of their shells agrees with that of the *Balanidæ*, and also of the Polyzoa. They are confessedly anomalous, and to a certain extent *sui generis*.

The Brachiopods inhabit all the zones of vertical depth. The Rev. M. J. Berkeley found a living specimen of *Terebratula caput-serpentis* attached to a rock at low-water mark, on a part of the Scotch coast where the tide falls only a few feet; I have taken the same species by dredging at various depths from 3 to 90 fathoms; M'Andrew and Barrett obtained *T. cranium* alive at 160 fathoms; and Dr. Wallich has shown me a shell of the last-named species which was brought up by sounding off the east coast of Greenland in 228 fathoms. The nature of the sea-bottom, more than the depth of water, determines the limit of their habitability.

This class has two great and distinct types of form, viz. the jointed and hingeless, although a fossil genus (*Davidsonia*) is considered by M. Bouchard-Chantereaux to form a connecting link between them. The above distinction was first noticed and proposed by M. Deshayes, and it is founded on malacological as well as conchological characters. By far the greater part of the Brachiopoda (including the *Terebratulidæ*) belong to the former section, while the other comprises only *Crania*, *Lingula*, and a few more genera. Both of these types or sections are represented in the British fauna.

* Jointed.

Family I. TEREBRATU'LIDÆ, Gray.

Body oval: *arms* folded back, and supported either by shelly processes issuing from the hinge of the lower valve, or by longitudinal septa or partywalls in that valve: *attachment* formed by a peduncle, which passes through a hole in the upper valve.

Shell longitudinally or transversely oval, more or less convex: *skeleton* or apophysary system consisting of riband-shaped plates, which are frequently looped or united: *hinge* formed of two side-teeth in the upper valve, which lock into sockets in the lower valve: *muscular scars* slight and seldom visible.

This family is very numerous and diversified in character, and it is also widely dispersed both in space and time. Some of its members occur in every sea, from the arctic to the antarctic pole; and its geological range appears to include all the known strata, from the Silurian to those which are now in course of formation. Colonna in 1616 was the first to use the name *Anomia,* and applied it to species of *Terebratula*; and Linné and other naturalists of the old school also placed them in the former genus, because they are attached to extraneous substances by a fibrous tendon passing through one of the valves of the shell. But although the analogy holds good to a certain extent, it is not complete. In this section of the Brachiopoda the *upper* valve, and in *Anomia* the *lower* valve is thus perforated, to say nothing of the very different organization of the animal and internal structure of the shell. Systematists are not yet agreed as to the number of genera into which this large family ought to be divided, nor whether any or how many subgenera are allowable. Either mode of distinction, however, is clearly artificial, and used merely for the sake of convenient classification. As our indigenous species are very few and reducible to two types, I do not wish to burden the nomenclature more than can be helped, and I therefore propose to adopt the genera *Terebratula* and *Argiope* only. These appear to have sufficiently definite characters by which one may be distinguished from the other.

Genus I. TEREBRA'TULA*, Lhwyd. Pl. I. f. 1.

Body convex: *mantle* free at its outer edges.

Shell acutely triangular: *beak* prominent: *foramen*, or byssal perforation, small: *hinge-line* curved: *skeleton* consisting of horizontally projecting blades, which are often looped.

There are only two British species, and for these as many genera have been proposed by some authors. I will arrange them in sections.

A. Shell smooth: *skeleton* consisting of two long blades, which are not looped or connected. (*Waldheimia* and *Macandrevia*, King.)

1. Terebratula cra'nium†, Müller.

T. cranium, Müll. Zool. Dan. Prodr. p. 249, no. 3006; Forbes & Hanley, vol. ii. p. 357, pl. lvii. f. 11.

Body cream-colour, with a brownish tinge: *mantle* thin; tentacles rather short, with small brown tubercles at their base: *arms* dark brown; cirri rather short: *peduncle* short and compact.

Shell oval, with sometimes a squarish outline, convex, rather thin, slightly lustrous: *sculpture*, smooth to the naked eye, but very closely tubercled when examined with a magnifying-power: *colour* white: *margins* compressed, often truncate and sometimes flexuous in front: *beak* rather prominent, but short, worn by rubbing against the stone or other hard substance to which the shell is attached: *foramen* oval, incomplete at the lower end: *deltidium* (or triangular space below the beak) slight, and divided by the point of the lower valve: *hinge-plate* of both valves exceedingly thick, forming strong supports for the teeth and lamellar processes; from these processes extend into the interior two diverging ridges or septa in the upper valve, and three or more in the lower valve: *teeth* of upper valve very strong and projecting towards each other: *sockets* in lower valve deep: *skeleton* consisting of two thin and elastic blades, which reach within about one-fourth of the front margin; they are furnished with upright spurs at a short distance from the hinge-plate, and have sharp points. L. 1. B. 0·8.

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* From the hole in the shell.

† From a fancied resemblance of the shell to a human skull.

Var. *oblonga*. Shell much narrower and deeper than usual, and having the front margin nearly straight.

HABITAT: Rocky and stony ground, from 50 to 90 fathoms, on the north and east coasts of Shetland, but exceedingly rare in a living state. More than fifty years ago, when the late Professor Fleming was Minister of Bressay Island, a stone was brought to him by one of his parishioners, a long-line fisherman, to which three specimens of this curious shell were attached. One of them was sent to Col. Montagu, who described it in the eleventh volume of the 'Linnean Transactions.' My late friend Mr. Barlee, as well as myself with Mr. Waller and Mr. Norman, have lately dredged specimens of various sizes and ages in the same part of our seas, at distances from land ranging from one to thirty-five miles. The locality ("Dublin Bay"), recorded by Dr. Turton in his 'Conchological Dictionary,' appears to be more than questionable, especially as he omitted it in his subsequent work on the British bivalves. This species does not appear to have been found in any of our upper tertiaries; but, in all probability, the *T. euthyra* of Philippi, a fossil from a corresponding formation in Sicily, is the same species. *T. cranium* is rather common on the Scandinavian coasts; and Dr. Wallich obtained dead specimens off the east coast of Greenland at the several depths of 108 and 228 fathoms.

According to Mr. Barrett, this is more lively than *T. caput-serpentis*, moving often on its pedicle, but it is more easily alarmed. The excellent Montagu must have indulged in an unusual nap when he imagined that the animal protruded its tube through the aperture of the beak, so as to serve the triple purpose of mouth, foot, and sucker, and that it was capable of a certain degree of locomotion! But his notion that, by means of the hinge, the valves are similarly and as firmly articulated as the claw of a crab, is much more correct, and shows his admirable power of observation. The internal skeleton is very different from that of *T.* (*Waldheimia*) *australis*. Having carefully cleaned the inside of a specimen of *T. cranium*, containing the dried remains of the animal, with a weak solution of potash, and examined several other perfect shells of different ages, I could not perceive the least appearance of a loop, which is so evident in *T. australis*. The lamellar processes in the lower valve of *T. cranium* are equal in length, and end in sharp points. They may be compared to the chariot-blades used by the ancient Scythians, and they somewhat resemble the falciform apophyses of *Teredo* and *Pholas*. In the young of *T. cranium* these processes are extremely short. Their arrangement and shape are so dissimilar in species closely allied in other respects, that I should be inclined to consider their importance, as characters of generic distinction, somewhat doubtful.

T. cranium was at first mistaken by Professors Fleming and Sars for *T. vitrea*, which is a native of the Mediterranean, and has a different foramen and skeleton. Dr. Leach gave the present species the name of *T. glabra*, and its habitat "the coasts of Devon." The young have slight ears, or triangular expansions, at the upper angles of the lower valve, as in *T. caput-serpentis*; and they are furnished with a very distinct and prominent crest or ridge, placed inside and nearly in the middle of this valve, resembling, except in position, the marginal plate of *Argiope cistellula.* This last-mentioned character likewise occurs in *T. septata,* Philippi, a Sicilian fossil (*T. septigera,* Lovén), and is remarkably developed in that species; but the foramen is incomplete in *T. cranium,* and entire in *T. septata.* Some specimens of *T. cranium* have the front margin more or less truncate, and others have slight and blunt ridges or angularities extending lengthwise to the front margin.

B. Shell longitudinally striate: *skeleton* composed of two short ribs, which are looped and form a kind of ring. (*Terebratulina,* D'Orbigny.)

2. T. CAPUT-SERPEN′TIS *, Linné.

Anomia caput-serpentis, Linn. Syst. Nat. ed. 12, p. 1153. *T. caput-serpentis,* F. & H. ii. p. 353, pl. lvi. f. 1–4.

BODY light orange-yellow: *mantle* thickened by calcareous spicula; tentacles extensile and pencilled, with a crimson tubercle at the base of each: *arms* bright orange, inclining to a crimson hue; muscular stem thick; cirri long, ciliated all over, and arranged in a single row: *peduncle* rather short, composed of numerous loose tubular fibres.

SHELL lyre-shaped, very variable in respect of length and breadth, sometimes nearly round and at other times oblong, convex in the middle but compressed towards the front and sides, rather solid, of a dull aspect: *sculpture,* scored by numerous longitudinal striæ or fine ribs, which radiate from the beak to the outer margins, becoming occasionally tuberculate where they are crossed by the lines of growth; some of these striæ are forked, or divaricate, being simple and stronger near the beak; the surface is closely studded with microscopical points, each resembling the bottom of a homœopathic bottle, being the termination of the tubular perforations characteristic of this family: *colour* yellowish-white: *margins* usually truncate or square in front, and sometimes indistinctly notched or indented in the middle; the sides are rounded: *beak* prominent but blunt, worn down obliquely by continual rubbing: *foramen* nearly round and incomplete below: *deltidium* very slight, being interrupted by the point or umbo of the lower valve: *hinge-plate* solid: *teeth* of upper valve as in *T. cranium*, but thicker and provided with a sort of bolt at the upper end: *sockets* in lower valve broad: *skeleton* consisting of two small but stout ribs, which are thicker at the shaft near the outer angle of the socket-joint, but afterwards become thinner and broader or flattened out, forming a double loop or bow, the upper one being nearly round, and the lower one of a transversely quadrangular shape with a curve above and below; this complicated process extends about three-eighths of the distance from the beak to the front margin; within the lower valve, beneath the umbo, is also a small tooth or tubercle; the inner margins are crenulated or slightly notched, with the points projecting outwardly, and furrowed in the middle: *inside* pearly and glistening. L. 0·85. B. 0·65.

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* From its resemblance to a snake's head.

Var. *septentrionalis*. Shell thinner, with finer ribs, and of a white colour. *T. septentrionalis*, (Couthouy) Stimpson, Test. Moll. New Engl. p. 75.

Habitat: 0–90 fathoms, on every part of the Scotch and Shetland coasts, and on the north-east, west, and south of Ireland, attached to stones, old shells, and occasionally to small sea-weeds and other substances. The variety occurs in Loch Duich, Inverness-shire, and off the east coast of Shetland. This now common shell was discovered in our seas by Professor Fleming, between forty and fifty years ago, in Loch Broom, on a stone which was brought up by the anchor of a vessel belonging to the Commissioners of Northern Lighthouses, while on their annual visit of inspection. As a tertiary fossil it occurs in the glacial deposits of Ayrshire (Geikie), and in the Coralline Crag (Searles Wood). M. Drouet has noticed it as fossil in the Azores. Its hydrographical range extends from Spitzbergen to Sicily; and the variety is not uncommon on the coasts of Norway and North America. Mr. Arthur Adams has lately dredged the typical form in the seas of Japan, at the depths of 26, 55, and 63 fathoms. He considers *T. Japonica* to be a distinct species. I have a monstrosity which is deeply cleft in the middle, so as to form two lobes of unequal size and height; and other specimens also are slightly distorted in the same way.

The brachial cirri are set on the muscular stem like the teeth of a comb, and when in action they bend forward in a most graceful manner. The pallial tentacles are also continually moving, and sometimes curl at the point like a crosier. When the shell is closed during the lifetime of the animal, these tentacles are still visible outside the edge of the shell, presenting the same appearance as in *Anomia*. Sometimes the upper valve is laden with a mass of barnacles and *Serpulæ*. The shells of young specimens are, of course, more strongly ribbed or striate than those of the adult; and the lower valve is eared. The fry, however, are perfectly smooth, and much longer in proportion than the adult; and they have a spoon-shaped, entire, and prominent beak. Owing to the shell being so thin and nearly transparent, the tiny arms are distinctly perceptible on the outside. In the early stages of growth the skeleton is not complete or annular, and it then somewhat resembles the scythe-shaped processes of *T. cranium*.

The *Anomia retusa* of Linné and *A. aurita* of Gualtieri, as well as the *T. nucleus* and *T. pubescens* of O. F. Müller, are synonyms of this species. The last-mentioned name originated in a coat of downy sponge, which not unfrequently covers the shell, and was suspected by the Danish zoologist to be merely a parasitic growth.

Risso called the present species *T. emarginata*; Mr. Lowe described the young as *T. costata*; Schlotheim appears to have given the name of *T. chrysalis* to the young of the variety *septentrionalis*; and Dr. Leach, with his unfortunate propensity to substitute new for old and well-known names, rechristened the species *T. striata*, adding that it inhabits the "western coasts of Devonshire"!

Genus II. ARGI'OPE*, Deslongchamps. Pl. I. f. 2.

Body compressed: *mantle* closely adherent to the shell throughout: *arms* short; tentacles so minute as to be almost imperceptible.

Shell obtusely triangular: *beak* more or less produced: *foramen* large: *hinge-line* wide and often straight: *skeleton* composed of transverse ribs, which are united to longitudinal ridges or septa.

The members of this genus are much inferior in size to those of *Terebratula*. Some are ribbed, and others smooth. Deslongchamps founded the genus in 1842; but D'Orbigny, apparently being unaware of that circumstance, proposed, five years afterwards, another name (*Megathyris*), deriving the characters from the same type. The chief difference between this genus and *Terebratula* consists in the latter having the mantle free at the outer edges, while in the former it adheres throughout to the shell, as well as in the large and wide rostral opening in *Argiope*, and its marginal and interrupted skeleton.

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* From the appearance of white holes in the outer surface of the shell.

A. Shell ribbed.

1. ARGIOPE DECOLLA'TA *, Chemnitz.

Anomia decollata, Chemn. Conch. Cab. viii. p. 96, pl. 78. f. 705 *a–d*. *Argiope decollata*, Jeffr. in Ann. Nat. Hist. 3rd ser. ii. p. 124, pl. v. f. 3 *a–e*.

BODY reddish-brown: *mantle* forming a thin film: *arms* nearly circular, divided into lobes, which correspond in number with the septa in the shell; cirri few and thick: *peduncle* very short.

SHELL of an irregular shape, varying from round to transversely oval, sometimes resembling that of a horse's hoof, compressed, much higher near the beak, and sloping abruptly in a wedge-like fashion towards the front and sides, solid, of a dull aspect: *sculpture*, 15–20 slight ribs which radiate from the beak but scarcely reach the margins; lines of growth rather strong or conspicuous; tubercles large and numerous, the interstices having a frosted appearance arising from a minute granular structure: *colour* light-brown: *margins* rounded at the front and sides, so as to form a semicircle, and obtusely angled behind: *beak* rather prominent and worn by continual friction; the under side shows distinctly the layers of increase: *foramen* exceedingly large, transversely and irregularly oval, in consequence of its having been made partly out of the umbo of the lower valve: *deltidium* scarcely traceable: *hinge-plate* remarkably thick and broad: *teeth* short and triangular: *sockets* broad and deep: *skeleton* composed of a series of narrow riband-like plates, which are curved and fit into the hollows between the septa, lying at no great distance from the front margin, and almost touching the shell; within the upper valve also are five septa, placed at equal distances, the middle and longest of which springs from under the beak; none of them reach the margin, which is wedge-shaped; in the lower valve are three strong equidistant ridges, which are placed in the central space; these are notched in front, crested at the top, and obliquely striate at the sides, where may be occasionally observed a few small bead-like tubercles. L. 0·3. B. 0·285.

HABITAT: 18 fathoms, in gravelly shell-sand, two miles east of Guernsey; rare. This is the most northern limit that has hitherto been discovered for the present species; nor has it been noticed as inhabiting the northern or western coasts of France. Its southern range extends from the Mediterranean to the Ægean, as well as to Madeira and the Canaries, at depths varying from 20 to 60 fathoms.

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* Truncate.

The upper valve of this curious shell is like a horse's hoof. The plates or ribs of the skeleton are not continuous, but separately attached to the sides of the septa.

Gmelin changed the original name to *detruncata*, without assigning any reason, and he even recognized the priority of Chemnitz by a correct reference to his work. According to Philippi, it is the *Terebratula aperta* of Blainville, and perhaps the *T. urna antiqua* and *T. cardita* of Risso. I should be inclined to consider also the *T. Soldaniana* of the last-named author as the young of the present species.

B. Shell smooth.

2. A. CISTEL'LULA *, Searles Wood.

Terebratula cistellula, S. Wood in Ann. N. H. vi. p. 253. *Megathyris* (afterwards changed to *Argiope*) *cistellula*, F. & H. ii. p. 361, pl. lvii. f. 9.

BODY yellowish-brown: *mantle* so extremely thin as to be scarcely visible: *arms* heart-shaped; cirri few and thick: *peduncle* rather long.

SHELL oval, heart-shaped, or oblong, and often wedge-like, compressed but rising gradually towards the beak, rather solid, occasionally somewhat glossy, but more frequently of a dull aspect, sometimes bilobed or cleft in the middle: *sculpture*, lines of growth numerous and exceedingly minute; tubercles close-set, and not very small: *colour* brown, with usually a yellowish tint: *margins* rounded at the sides and also slightly in front, forming behind angles of different degrees: *beak* mostly blunt and often worn by attrition, never much produced: *foramen* triangular, occupying nearly the whole of the dorsal area: *deltidium* exceedingly slight: *hinge-plate* thick and broad: *teeth* strong and triangular: *sockets* broad but not deep: *skeleton* consisting of two very slight and narrow riband-like plates or ribs, placed as in *A. decollata*, but having only their front edges free, the remaining portion being united with the shell; within the upper valve is a septum, extending from the centre of the hinge to nearly the front margin, besides a few parallel but indistinct striæ; the lower valve has a strong blunt central ridge, which is higher in front and occupies about half of the interior; the front margin is minutely crenulated inside. L. 0·06. B. 0·075.

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* A little chest.

HABITAT: East Shetland, Skye, and co. Antrim; Moray Firth (Dawson); Dublin Bay (Waller); Exmouth (Barlee and Clark); Guernsey (Lukis & J. G. J.). Fossil in the Coralline Crag. Sars has found it at Christiansund, Bergen, and Manger in Norway; I have taken it on the Normandy coast; and among some small shells which I received through M. Vérany from Sardinia was a single valve of this species.

The animal closely resembles that of *A. decollata*. The anterior occlusor or retractor muscles are of enormous size, and their impressions on old shells are very conspicuous and deep, somewhat resembling those of *Crania*. Very young shells have scarcely any of the tubular perforations; and their beaks remind one of the bill of a *Platypus*. These delicate processes become afterwards hardened and blunted by contact with the external world, like the exquisitely sensitive feelings of a child. The fry may be occasionally seen attached to the outer folds of the mantle. They appear to be kidney-shaped, and are of different sizes, or degrees of development.

This species was named, but not described, by Mr. S. Wood in 1840 as a tertiary fossil; and I was fortunately enabled to discover it seven years afterwards in a living state. It may be easily distinguished from *A. decollata* by its minute size and smooth surface, as well as by its internal structure. It differs from *A. Neapolitana* in being only half the size and more convex, in the foramen being much larger, and in the inside margin of the upper valve being slightly and closely crenulated, instead of having rather strong and distant tooth-like notches, which is the case in *A. Neapolitana*.

3. A. CAP′SULA*, Jeffreys.

Terebratula capsula, Jeffr. in Ann. N. H. ser. 3, ii. p. 125, pl. v. f. 4, and iii. pl. ii. f. 7, 8.

BODY yellowish: *peduncle* rather long and slender.

SHELL nearly equivalve, oval or pouch-shaped, compressed but rather higher towards the beak, glossy: *sculpture*, lines of growth slight and remote; tubercles as in the last species: *colour* yellowish-brown: *margins* rounded at the sides and in front, almost straight behind, giving that part the appearance of being auricled: *beak* slightly prominent, its point separated by the hinge-area: *foramen* triangular, but not disproportionately large, occupying about two-thirds of the dorsal space: *deltidium* imperceptible: *hinge-plate, teeth*, and *sockets* as in the last species: *skeleton* undeveloped, and septa wanting. L. 0·03. B. 0·02.

HABITAT: 18–25 fathoms, Plymouth (Norman, from Webster); Guernsey (Lukis); Dublin Bay, and off Portrush (Waller); and Larne, co. Antrim (Hyndman & J. G. J). It occurs with *A. cistellula*, nestling in the hollows of old shells of *Pectunculus glycymeris* and other bivalves, frequently among clusters of *Lepraliæ*. I have found it also at Etretat in Normandy on stones which had been taken up in trawl-nets at a distance of about four leagues from land.

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* A little box.

The beak resembles that of *Lingula*. Very young shells are not tuberculated. This species cannot be mistaken in any stage of growth for the fry of *Terebratula caput-serpentis,* which are of quite a different shape, and more inequivalve than the adult. I have specimens of the fry of that species only half the size of *A. capsula*. The fry of *T. cranium,* which I have taken of even a smaller size, have a longer and more slender shell, and the valves are decidedly unequal. From the young of *A. cistellula* the present species may be distinguished by being of a regularly oval shape and more convex in every part, but especially by the contracted hinge-line and comparatively small aperture.

Professor King proposed to make this species the type of a new genus, which he named *Gwynia,* out of compliment to me; but although I duly appreciate the intended honour, I cannot conscientiously accept it. Although the species is unquestionably distinct from any of the foregoing, it may be the young of *A. Neapolitana* (probably *T. cordata* of Risso); and I feel pretty confident that the last-named species will be found on our own as well as the Mediterranean coasts.

Terebratella (or *Megerlea*) *truncata* has but a very slender claim to be admitted into our fauna. Dr. Turton's cabinet contained a specimen bearing, in his handwriting, the name of "*Terebratula caput serpentis,*" and the locality "Torquay." It is not uncommon in the seas of southern Europe; and according to Collard des Cherres it has been found on *Caryophylliæ* at Quimper. In a footnote to the 'British Mollusca' (vol. ii. p. 362) this species has been accidentally mistaken for *Argiope decollata,* with reference to Turton's shell.

I am by no means satisfied that *Rhynchonella psittacea* still inhabits the British seas, although there is abundant evidence of its having been formerly a native. Dr. Turton described it in his 'Conchological Dictionary' as having been thrown up, after a severe gale, on the shore near Teignmouth—a most unlikely place. Professor King is said to have obtained two dead specimens and a single valve off the Northumberland coast, attached to the byssus of a *Mytilus modiolus.* Mr. Maclaren recorded the species as having been procured also from a fisherman on the Berwickshire coast; and Capt. Laskey is reported to have taken it by dredging in the Firth of Forth. Capt. Thomas appears to have likewise dredged valves off Berwick, and Mr. Dawson off Aberdeen. In deep-sea dredging off the Shetland Isles, I have more than once found single valves, and this year a nearly perfect pair. Dr. Turton's specimen has a very ancient aspect; Professor King's and some of my own are remarkably fresh-looking, and they may possibly be recent; but I am rather disposed to think they are some of the relics of the glacial epoch. The shell being of a horny texture, would not be liable to undergo much, if any, change while it remained under water. A live specimen has never been taken, so far as I am aware, anywhere south of Drontheim, where it seems to dwindle in size. It is a gregarious species, and therefore common wherever it occurs. The arctic seas of both hemispheres constitute its proper habitat. As a tertiary fossil it is found in the Norwich or Mammaliferous Crag and later deposits.

** Hingeless.

Family II. CRANI′IDÆ, (*Craniadæ*) King.

Body circular: *arms* spirally coiled, and not supported by any shelly process or septum: *attachment* formed by the adhesion of the lower valve, or part of it, to other substances.

Shell circular or subquadrangular: *upper valve* conical or cap-shaped: *lower valve* flat: *muscular scars* remarkably strong and conspicuous.

Our seas contain at present one only of this hingeless group of Brachiopoda, which is distinguishable from all the preceding kinds by the upper valve being conical and the lower valve flat and attached, as well as in neither valve being perforated. The shell is opened by the action of the adjustor or protractor muscles; and this takes place only to a very limited extent. Through the *Discinidæ* there appears to be a passage to *Anomia*, both of which have a byssal peduncle issuing out of a hole or slit in the lower valve for attachment to other substances.

Genus I. CRA′NIA*, Retz. Pl. I. f. 3.

As the family contains but this single genus, it is unnecessary to recapitulate the characters.

1. Crania ano′mala†, Müller.

Patella anomala, Müll. Zool. Dan. Prodr. p. 237, no. 2870. *C. anomala*, F. & H. ii. p. 366, pl. lvi. f. 7, 8; (animal) pl. U. f. 2, as *C. Norvegica*.

Body of a milk-white colour, tinged with yellow or brown: *mantle* very thin: *arms* thick and fleshy; cirri rather numerous, stiff, and rather long.

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* From a fancied resemblance of the inside of the lower valve to the front of a human skull.

† Irregular.

Shell nearly round, with a square outline: *upper valve* umbrella-shaped above, more or less compressed, rather solid, of a dull aspect: *sculpture,* wrinkled by the circular marks of growth, sometimes microscopically but irregularly striate longitudinally: *colour* reddish-brown or yellowish, with blotches or faint streaks of the first-mentioned hue: *margins* thin and sharp: *beak* very small, nipple-shaped, placed nearer the dorsal end: *lower valve* of various degrees of solidity, according to the age and quickness of growth, but the inside margin is always broad, thickened, and raised, so as to form a ridge or rampart round the enclosed space; it is reticulated or closely pitmarked within: *muscular scars* in both valves deeply marked. L. 0·55. B. 0·5.

Habitat: 18–90 fathoms, on almost every part of the Scotch and Irish coasts, as well as in the seas of Shetland and the Orkneys; Isle of Man (Forbes). Abroad it is distributed from Greenland to Vigo; and I have been unable to detect any difference between this species and the *C. ringens* of Höninghaus, which is not uncommon in the Mediterranean and Ægean Seas. Specimens from all the above localities vary much in shape, and in the depth of the circular wrinkles or furrows, and not less in the position and size of the muscular scars.

Even the sagacious Müller was deceived by the strange aspect of this shell. He placed it in the genus *Patella,* having observed the upper valve only; although he admitted that the animal (which he styled "vermis singularissimus") differed *toto cœlo* from a limpet, and that the shell, on closer inspection, was not quite the same. It is most singular that he overlooked the lower valve. His comparison of the branching arrangement of the arms to the dusky horns of a wild goat is not inappropriate. Sometimes the shell is ribbed across or obliquely, having taken the impression of an *Astarte* or *Pecten,* on which it has been moulded. Being often affixed to rugged stones or small pebbles, its shape is adapted to the angles and extent of the basal surface. When it has bare standing-room only, it increases in height and becomes regularly conical. The under valve of specimens attached to the smooth shell of a *Pinna* is usually a mere film. The brachial fringe can be protruded slightly beyond the margin of the shell at each side, but never in front or at the back. It may be likened to the spokes of two wheels, each placed on its nave within a circle; and as the spokes are nearly equal in length, it is evident that at the point where the wheels approach each other, the inside spokes project into the space between the wheels, and not outwardly. There are no cirri at the back. The lower or flat valve contains only the base of the adductor muscle, upon which as a pivot the upper valve turns by a semirotatory but very confined motion. The arms and rest of the body are enclosed in the upper or convex valve. The animal is by no means timid. When a camel's-hair brush is thrust between the gaping valves, they immediately close, but in a few seconds after open again; and this teasing experiment can be repeated many times, without alarming the *Crania*, or making it sulky. The cirri are not retractile, and do not withdraw or shrink when touched. Each arm has about sixty of them. The fry are quite white and semitransparent, and they have only a few tubular perforations. They adhere in the same way as their parents. Their appearance is not unlike that of the very young of *Anomia ephippium*. The largest specimen in my cabinet measures over four-fifths of an inch in diameter.

Montagu called this species *Patella distorta*; and it has borne many other names, both generic and specific, the latest being that of *Criopus Orcadensis*, given to it by Dr. Leach.

Class CONCHIFERA.

Order LAMELLIBRANCHIATA.

The principal characters of this Order have been already given in the former volume. A few of the members (*e. g.* certain species of *Lucina*, *Tellina*, and *Thracia*) are said to have only one branchial leaflet or gill on each side of the body; but in all probability this leaflet is double, although united and apparently single. The Order is divisible into two unequal groups, which may be distinguished from each other by the number of adductor muscles. The first and smaller group (MONOMYARIA) has but one muscle, which is placed nearly in the middle, or rather towards the back. The other and far larger group (DIMYARIA) has two separate muscles, which are placed on the right and left sides of the body. The scars or impressions made by these muscles on the inside of the shell serve to instruct the geologist to which group every bivalve belongs. The British Monomyaria comprise the families *Anomiidæ*, *Ostreidæ*, and *Pectinidæ*. All the remaining families are Dimyarian. The late Mr. Clark says that the only true Monomyarian Mollusca are *Pholas* and *Teredo*; but his observations in this respect do not agree with those of other conchologists. I do not attach much importance to the form, or even the presence of the pallial scar, being the mark left on the inner margin of the shell by that part of the mantle which adheres to it and keeps the rest of the body in its proper place; although this character may serve to recognize certain genera. In some families the mantle is open on all sides but the back, for the admission of food and water, as well as for the ejection of fæcal matter; while in others it is more or less closed in front, or open only in that part for the passage of the foot. In the latter case the mantle on one or either side is folded, so as to form a single or double tube. This usually takes place on the posterior side, where the shell is broadest; but in a few instances (as in the *Kelliidæ*) the incurrent or alimentary tube is placed on the anterior side, and the excurrent or anal tube on the posterior side. The tubes are of various lengths, and when they do not project beyond the edges of the shell they are termed "sessile." The excretory opening is always situate on the upper part of the posterior side. That by which the animal takes in its nourishment, and which supplies the gills with aërated water, is usually on the same side, but below the other opening. The excretory opening or tube is the smaller of the two. With respect to the reproductive system of the *Lamellibranchiata,* it is by no means settled whether any, or which of them, have separate sexes. Lovén is positive that such is the case in *Modiolaria,* the embryogeny of which he has investigated with his usual care; and Sars assures us that *Axinus* is unquestionably also diœcious. I have not myself examined the question; but I would refer my readers to what I have already said in page xxv of the Introduction to the first volume.

* Mantle open and without tubes.

Family I. ANOMI'IDÆ, (*Anomiadæ*) Gray.

Body roundish: *mantle* having very thin edges, which are furnished with fine and extensile tentacular filaments: *gills* circular and double: *foot* small: *muscle* divided into two or three parts, the largest of which passes through a hole in the hinder part of the lower valve, serving for attachment to extraneous bodies, and forming on them a fibrous or horny plug.

Shell generally circular and flat, more or less inequivalve: *orifice* pear-shaped, being interrupted behind by a narrow slit: *cartilage* internal, short, placed somewhat obliquely below the beak.

This family is connected with the *Ostreidæ* by the genus *Pododesmus* of Philippi. Dr. Leach proposed to raise it to the rank of an Order, which he called *Trimya*.

Genus ANO'MIA*, Linné. Pl. I. f. 4.

Body compressed.

Shell inequilateral, of an irregular shape, dependent on that of the substances to which it is attached: *upper valve* rather convex and thick: *lower valve* flat and thin: *hinge* toothless.

As I have before observed, Fabius Colonna, the originator of this name, applied it to species of *Terebratula*. About a century and a half afterwards Linné used it in the same sense, for he described the animal as having two arms, and the shell as furnished with two bony processes or radii, the deeper valve being often perforated at the base. But he included in the genus many species which we now recognize as belonging to *Anomia* thus restricted, and long custom has sanctioned the modern use of the word. Poli proposed the name of *Echion* for the animal of the present genus. According to Dr. Carpenter the outer layer of the shell has a prismatic cellular structure; and in this respect it appears to resemble the shell of *Argiope*. There is no visible trace of an epidermis. The plug of attachment is secreted by that part of the adductor muscle which passes through the lower valve. It is not shelly. The fry are fixed in the same way as the adult, soon after their exclusion from the ovary; although it would appear that they enjoy in the mean time a short period of liberty, like their relative the oyster. The *Anomiæ* are popularly designated in this country "silver-shells." In the State of New York they are called "Jingle-shells." Dr. Otto Torell informs me that no species has been found north of Iceland; but fossil shells are not uncommon at Uddevalla in the same bed which contains *Terebratella Spitzbergensis, Piliscus commodus*, and other forms of an extremely arctic kind.

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* Irregularity.

1. ANOMIA EPHIP′PIUM *, Linné.

A. Ephippium, Linn. Syst. Nat. p. 1150; F. & H. ii. p. 325, pl. lv. f. 2, 3, 5, 7, and (animal) pl. T. f. 2.

BODY somewhat depressed, red, yellow, brown, or of all intermediate shades of those colours: *mantle* circular: *cirri* or tentacular filaments arranged in two or three rows, ciliated or feathered, yellowish-white: *mouth* large, with a pair of long delicate lips on each side: *foot* short, cylindrical, and white, sometimes curved and protruded from a slit in the shell above the orifice, for the purpose of spinning a byssus and affording an additional means of attachment.

SHELL round, oval, oblong, cylindrical, angular, or even amorphous, compressed, and sometimes flattened, of different degrees of thickness according to age, outside of a dull appearance, although the inner layers are remarkably glossy and iridescent: *sculpture*, scaly and sometimes prickly, minutely striate in a longitudinal direction, and marked by irregular lines of growth: *colour* white, with often a yellowish, pink, rose-red, or brown tint: *margins* thin, rounded or wavy unless contracted by position, nearly forming an obtuse angle behind: *beak* straight and very small, not projecting beyond the dorsal margin: *cartilage* short but strong, broad, semilunar, and fixed in a cavity underneath the beak: *hinge-line* slightly curved: *hinge-plate* thick and broad: *orifice* oval; outer edge reflected: *inside* silvery and iridescent, sometimes having a green tint, furnished in the lower valve at the hinge-end with a thickened ledge to receive and support the cartilage: *muscular scar* large, showing in the upper valve the impressions of three inner portions of the muscle, which are nearly circular and disposed in a descending but irregular line from the hinge, and in the lower valve only one similar impression, which is placed on the right hand of the observer: *plug* cylindrical, thick, and longitudinally striate. L. 2·3. B. 2·5.

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* A horse-cloth.

HABITAT: From low-water mark to 80 fathoms on every part of our coasts, attached to shells, stones, sea-weeds, and other substances. In a fossil state it occurs in our newer tertiaries, as well as in the Coralline Crag, and in the Italian pliocene deposits. It is likewise found in the post-glacial beds of Bohuslän, Sweden, associated with arctic shells. It is widely distributed in the European seas, from Iceland to the Ægean Archipelago; and its range also comprises Algeria, Madeira, North America, Russia, Lapland, and the Black Sea. Danielssen has recorded it as having been dredged in the Scandinavian seas at a depth of 180 fathoms.

In consequence of the lower valve being moulded on the extraneous bodies to which it is attached by the plug, the upper valve partakes of a corresponding impression, and the result is that the shell puts on a Protean variety of shape. Bouchard-Chantereaux says that out of two hundred specimens it is almost impossible to find two exactly alike. When a specimen is affixed to a *Pecten*, *Astarte*, or other ribbed shell, it is similarly sculptured. No less than thirty-four species have been made out of the one now described; and naturalists of every country have had a hand in this wholesale manufacture. Eighteen of these species have been enumerated as synonyms by Forbes and Hanley. The variability of the shell, however, is now such an established fact, that a conchologist who would attempt to restore any of these so-called species must have greater ingenuity than even the learned knight, of whom it was said

> "He could distinguish and divide
> A hair, 'twixt south and south-west side."

The variety "*squamula*" is flatter and smoother than usual; "*aculeata*" has the imbricated scales pinched up into vaulted or hollow spines; and the narrow form of "*cylindrica*" arises from the young *Anomia* selecting for its resting-place a small stem of sea-weed, which obliges it to assume a saddle-shape, not having any room for lateral development. Occasionally specimens are found exhibiting the characters of more than one variety, being half "*squamula*" and half "*aculeata*." The animal is said to be poisonous; and Mr. M^{c}Andrew informs me that the captain and some of the crew of his yacht were suddenly taken ill at Vigo, after having eaten some fine *Anomiæ*, which looked to them so temptingly like oysters. The muscle of attachment appears to have an excavating or eroding power, like the foot of a limpet or other boring mollusk. When an *Anomia* is fixed to the shell of an oyster, the lower part of the plug is sunk below the level of the surface, and is separated from it by a kind of sloping ditch. This gives a stronger hold; and the base of the plug is often spread out, so as to increase the fulcrum. The structure of the plug is very remarkable. It is composed of perpendicular plates, which are alternately high and low; and the striated appearance of the top or outer covering is produced by the edges of the higher plates. This appendage is capable of receiving a high degree of polish, and in that state it resembles ivory and is equally close-grained. In the fry the orifice is larger in proportion to that of the adult, and is placed on one side. The beak of young specimens is sometimes much produced, and at other times slightly incurved. When the shell is thin, the long muscular scar seen through the upper valve resembles a white line. The varied and nacreous hues of the shell rival in lustre those of an opal. A group of these specimens from Lulworth Cove, on a valve of *Pecten opercularis,* now before me, are of different colours, white, yellow, and pink, and reflect their pearly gleams in every direction. In substance the shell bears some affinity to talc. Specimens from Bantry Bay, Lough Strangford, and Exmouth roads are larger than usual. One from the first-named locality measures four inches in diameter. Now and then, but rarely, the upper valve is flat, and the lower or perforated valve is convex; and in one case the front half of the shell is divided into two distinct lobes, owing to the continual obstruction and irritation caused by a small branch of *Sertularia abietina,* which had insinuated itself and grown up in front of the *Anomia.* But a more curious instance of an adaptation to circumstances is presented by specimens which I found many years ago on a mussel-bed in Swansea Bay, laid bare by an unusually low tide. The orifice in every specimen was completely closed by a series of thin vaulted plates of the same material as the shell. All the specimens were living, and attached to the mussels by the byssal threads of the latter. It appeared to me that, having been accidentally detached from oysters in an adjoining bed, to which they were originally affixed, and being thus deprived of their plugs, as well as of the power to make new ones, they filled up the openings with a shelly substitute, for the sake of protection against starfishes and other enemies. Having lost their own plugs, they were well satisfied by being securely moored to the bed by the strong cables of their friendly neighbours, the mussels. I dredged a specimen of the variety "*squamula*" off Croulin Island, Skye, which was free, but had the orifice completely closed in the same way as the Welsh examples. The *A. tubularis* of Turton is a young specimen of the same variety, in which the orifice had only been partially closed. Old Martin Lister was well acquainted with the typical form, and gave an excellent figure of it in his 'Historia Conchyliorum.'

2. A. PATELLIFOR'MIS *, Linné.

A. patelliformis, Linn. Syst. Nat. p. 1151; F. & H. ii. p. 334, pl. lvi. f. 5, 6.

BODY resembling that of *A. ephippium*, but the colour is deeper: *mantle* thinner: *cirri* of unequal length and size, and capable of considerable extension, some of them being a quarter of an inch long; they are minutely and closely ringed, and a dusky line runs down the middle of each. No other part of the animal is visible outside.

SHELL round or sometimes longitudinally oval, usually flattened, thin, rather glossy towards the beak, but elsewhere of a dull appearance: *sculpture*, fine and close-set imbricated scales, and 20–30 blunt ribs which radiate from the beak in every direction towards the margins in a wavy manner; lines of growth irregular: *colour* yellowish-white, with frequently reddish-brown but not continuous streaks or spots: *margins* thin, scalloped or notched by the ribs, nearly straight behind: *beak* small, rather prominent, very seldom reaching to the hind margin, and never overlapping it: *cartilage* short and narrow, fixed in a cavity beneath the hinge: *hinge-line* slightly curved: *hinge-plate* thick but narrow: *orifice* rather large, much broader below than above; outer edge not reflected: *inside* bluish-green, highly iridescent, furnished in the lower valve with a ledge to receive the cartilage: *muscular scar* large, showing in the upper valve the impression of two inner portions of the muscle of a roundish-oval shape and often confluent, the larger one of which is placed in the middle, and the smaller one a little below it on the left-hand side; in the lower valve there is only one impression, placed as in the last species: *plug* pear-shaped, thin, and coarsely striate lengthwise. L. 1·3. B. 1·45.

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* Shaped like a *Patella*, or limpet.

Var. *striata*. Shell sometimes nearly convex, covered with numerous and fine longitudinal striæ, which often rise into minute scales, becoming prickly and occasionally decussated by the transverse lines of growth; coloured rays more distinct and somewhat wavy. *A. striata*, Lovén, Ind. Moll. Scand. p. 29. F. & H. ii. p. 336, pl. lv. f. 1, 6, and pl. liii. f. 6.

Habitat: 10–86 fathoms, on hard ground and shell-banks everywhere, usually concealed in the hollows of old bivalves. It is, however, not so common as the last species, although equally diffused; and they are found together. The variety occurs in Shetland and on the west coast of Scotland. *A. patelliformis* is a tertiary fossil of the Clyde beds, and of the Red and Coralline Crag, as well as of the newer deposits of Italy and Sicily, and also of the Uddevalla shell-bed. Abroad this species ranges from Scandinavia to the Mediterranean. According to Chierighini it inhabits the Adriatic; Weinkauff has included it in his list of Algerian shells under the name of *A. pectiniformis*, Philippi; the variety, as well as the ordinary form, have been taken by M. Martin in the Gulf of Lyons; Middendorff has recorded it from Sitka Sound, and Dr. Philip Carpenter from the North-west coast of America.

It differs from *A. ephippium* in its more regular outline, thinner texture, coloured streaks, peculiar sculpture, the number and position of its muscular scars, and flat (instead of raised) plug. It is also not so susceptible of outward impressions as that species. An *A. patelliformis* attached to a scallop, although it sometimes partakes of its companion's ribs, has also its own natural ribs, which run their independent course from the beak to the margins. The orifice in young specimens is nearly round. The prominent beak somewhat resembles the apex of a limpet. The plug lies in a hollow, which is apparently made in the same way as I have suggested with regard to the other species. Owing probably to the green colour of the liver, the rostral area or nucleus of the shell always appears to have a similar tinge.

It is not without considerable hesitation that I have ventured to unite with this species the *A. striata* of Lovén; but, after examining his types at Stockholm, and a long and careful comparison of a great many specimens of this beautiful variety, I cannot make out any definite specific character. The only difference consists in the more delicate sculpture of Lovén's shell; and specimens may be observed in which the ribs and striæ blend so insensibly into each other, that it is impossible to say whether they belong to the typical species or the variety. Judging from Linné's description of *A. patelliformis,* this variety appears to correspond with it better than the typical form. I consider it analogous to the variety "*aculeata*" of the last species.

A. patelliformis has not received so many names as *A. ephippium,* and I can only find fourteen of them. The *Ostreum striatum* of Da Costa (but not that of Lister) appears to be this species. It has been placed by some conchologists in the genus *Placunanomia* of Broderip; but the distinctive character of that genus lies in having two cardinal teeth, as in *Placuna* and *Placenta*, and is not applicable to the present species.

Family II. OSTRE'IDÆ, Broderip.

Body round: *mantle* having rather thick edges in front: *cirri* short: *gills* simple. There is no foot, or muscle for external attachment. The animal is fixed in the earlier stage of its growth, and sometimes in its adult state, by the lower or more convex valve of its shell.

Shell circular, longitudinally oval or oblong, or of an irregular shape, and inclined to be wedge-like, inequivalve: *hinge* toothless, but having its margins sometimes notched: *cartilage* internal, short and curved, placed horizontally on the hinge-line.

Some genera are exotic, and others are extinct or known only as fossil. We have but the typical genus. The Oyster family differs from that of *Anomia* in the gills being simple, in having no foot or plug of attachment, and in the shells being either free or adhering to other substances by the lower valve, which is invariably larger and deeper than the other.

Genus OS'TREA *, Linné. Pl. I. f. 5.

Body compressed.

Shell composed of numerous imbricated or tile-like plates, which overlap one another in succession: *beaks* disunited: *cartilage* strengthened by a ligament on each side of it.

The so-called species of *Ostrea* are exceedingly numerous, and many of them are only distinguishable by very slight characters. Almost every sea appears to have several species or varieties. Their general form is very inconstant and often irregular. It is more than probable that when a sufficiently extensive series from each place, and especially in the earlier states of growth, have been carefully examined and compared, many recent species may become "extinct" in consequence of a reduction in number, and with great advantage to science. Poli gave the animal the name of *Peloris*. But that was not an oyster.

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* Oyster.

> Murice Baiano melior Lucrina peloris,
> Ostrea Circeiis, Miseno oriuntur echini,
> Pectinibus patulis jactat se molle Tarentum.

OSTREA EDU'LIS *, Linné.

O. edulis, Linn. Syst. Nat. p. 1148; F. & H. ii. p. 307, pl. liv., and (animal) pl. T. f. 1.

BODY much compressed, although rather thick, of a pale drab colour more or less tinged with brown: *mantle* nearly circular: *cirri* arranged in two rows, the outer one of which is double but irregular, and the inner one single: *mouth* furnished with a pair of large and nearly triangular lips on each side.

SHELL round in its young state, and afterwards spreading out in front or at the sides, with frequently a more or less curved outline, usually compressed, rather thick, of a dull appearance outside: *sculpture*, foliated or scaly; lower valve sometimes strongly ribbed lengthwise; the entire surface of the shell when young is microscopically shagreened; lines of growth well marked: *colour* yellowish-brown: *margins* thin and closely appressed or squeezed together, usually semicircular in front and more or less rounded at the sides: *beaks* small, divided by the *cartilage*, which is thick and very strong, light-brown or horncolour, and supported on each side by a short ligament of a dark olive-green: *hinge-line* narrow and nearly straight: *hinge-plate* thick: *inside* white and pearly; lateral edges (especially of the flat valve) finely crenulated or notched on the upper part: *muscular scar* obliquely transverse, pear-shaped or slightly incurved above. L. 3. B. 3·5.

Var. 1. *parasitica*. Shell much smaller, flatter, and more glossy; colour purplish or greenish-brown, with streaks of a darker hue radiating from the beaks. *O. parasitica*, Turt. Conch. Dict. p. 134, f. 8.

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* Eatable.

Var. 2. *hippopus.* Shell large and extremely thick. *O. hippopus,* Lam. An. sans Vert. vii. p. 219.

Var. 3. *deformis.* Shell small, distorted, and often nearly cylindrical. *O. deformis,* Lam. l. c. p. 229.

Var. 4. *Rutupina.* Shell small, transversely oval and of a regular shape.

Var. 5. *tincta.* Shell flattened and attached in every stage of growth; inside of a rich purplish-brown or olive-green; hinge-margins strongly crenulated.

Habitat: 0–45 fathoms, on every part of our coast from Shetland to the Channel Isles, usually gregarious and forming beds of various extent. Var. 1. On shells, crabs, and other substances, having rather a more southern distribution. When this variety is affixed to a ribbed scallop, it adopts the markings of that shell, but it retains its own colour. It appears to be the *O. depressa* of Philippi. Var. 2. In deep water and solitary. Var. 3. Occupying the crevices of rocks in the littoral and laminarian zones, and called the "rock-oyster." Some specimens resemble a *Gryphæa* in shape. Var. 4. Coasts of Essex and north Kent, in a semicultivated state, and well known in this country as "natives." Var. 5. West of Scotland and Burra Isles, Shetland. Mr. Grainger has noticed this ubiquitous species as "imbedded in considerable myriads" in a raised pliocene deposit at Belfast; and, according to Mr. James Smith and Mr. Geikie, it occurs in the Clyde beds and other glacial deposits in Scotland. Red and Coralline Crag (S. Wood). The shells may also be seen mixed with those of peculiarly arctic species in the raised sea-beds near Uddevalla. It is very difficult to ascertain its foreign distribution, with any tolerable degree of correctness, in consequence of its specific identity being enveloped in such a cloud of different names. Depending, however, on those authorities which appear to be most accurate, I consider that its range extends from Iceland (Mohr) to Naples (Scacchi) and the Adriatic (Chierighini). I can answer for the common form, as well as the variety *parasitica*, being found at Cannes. Müller, Lovén, Lilljeborg, Asbjörnsen, and Malm have recorded it as inhabiting different parts of the Scandinavian sea, from Christiansund southwards; and Mr. M^cAndrew has found it in Vigo Bay and off Gibraltar. Philippi says that in Sicily it occurs in a fossil state only. According to Gould, it is undistinguishable from the oyster of New York. It has not been observed by Dr. Otto Torell or any arctic explorer on the coasts of Greenland; but it is common in some of the postglacial beds near Uddevalla and in the diocese of Christiania, associated with high-northern shells.

Although we are now favoured with only one species of what Gmelin termed the "vermis sapidissimus," and the supply is never equal to the demand, the case was very different in days long since past. E. Forbes says, "During ancient epochs, as we learn from the fossils of both tertiary and secondary strata, many more kinds of oyster lived within our area, and multiplied so as to rival the contents of any modern oyster-beds. The discoveries of geologists open scenes of regret to the enthusiastic oyster-eater, who can hardly gaze upon the abundantly entombed remains of the apparently well-fed and elegantly-shaped oysters of our Eocene formation, without chasing 'a pearly tear away,' whilst he calls to mind how all these delicate beings came into the world, and vanished, to so little purpose." However, there is some consolation in the idea that the breed of oysters may have since improved by "natural selection," and that, if any of our prehistoric ancestors existed in those bygone epochs, they were not so well off as we are for the quality of this gastronomic luxury. Oysters seem to have been as much sought for and enjoyed in the "stone" age as they are at present, judging from the vast heaps of large empty shells which are found in the Danish kjökkenmoddings, as well as in the northern parts of the British isles.

Lister was the first to describe the anatomy of the oyster, from particulars which were communicated to him by Dr. Willis. This description is tolerably accurate; and if the authority could be wholly relied on, these mollusks ought not to suffer the discredit of being so stupid as is proverbially alleged in Norway and Brittany. Willis states that when the tide comes in they lie with their hollow shells downwards, and when it goes out they turn on the other side; and he adds that they do not remove from their places, unless in cold weather to cover themselves with the ooze! Lister appears to have trusted too much to his friend, and not to have learnt for himself the fact that oysters have not the slightest power of locomotion, except in their embryonic state. Bishop Sprat's account of our oyster-fisheries, which has been so often quoted in works on natural history, was chiefly compiled from this communication of Dr. Willis. The "spat," said to be like a drop of candle-grease, is a pure fiction. From April to July the ova are continually excluded from the ovary and discharged into the gills, where they are hatched. Every batch of fry in succession is then committed to the sea; and the young commence life as free animals, like other bivalves, swimming or rather flitting about with considerable rapidity by means of numerous cilia which fringe their circumference. Each is enclosed in an extremely thin and prismatic semiglobular bivalve case. In the Report of the British Association for 1856 Mr. Eyton has given some further information as to the appearance and habits of the oyster-fry. He says, "The animal was semitransparent, with two reddish elongated dots placed on each side behind the cilia, which were in constant and rapid motion. They were exceedingly tenacious of life, the cilia moving until the water was dried up upon the glass. Some that I placed in a little salt and water were alive the next day." After a short enjoyment of freedom they attach themselves to a stone or some other object; the mantle soon afterwards begins its work of secretion, and converts the case into a shell; the latter becomes agglutinated to some extraneous body; the cilia and eye-like spots disappear, and the permanent organs are developed. This metamorphosis has its parallel in the Cirripedia and other classes of invertebrate animals. The parent oyster is slow in recovering from its long-continued parturition; and it is not fit to eat until about the middle of August. Indeed, it is not considered to be in full flavour until September. The period of its longevity is not known. It is said to be in prime condition from the fourth to the seventh year, and rarely to live beyond its fifteenth year. If the numerous laminæ or plates of which the shell is composed denote the marks of annual growth, some individuals must attain a very venerable age; but these plates are formed inwardly, instead of outwardly as is the case with the trunks of coniferous trees, and the analogy therefore fails. A severe winter causes great mortality among those which are laid in park sor shore-beds, in consequence of the valves being closed by ice during the recess of the tide. In all probability the stock of sea-water, which had been taken in before the oyster was laid bare, requires occasional aëration from the atmosphere. The green colour, so much prized by the Parisians, is owing to the oyster feeding on the *Navicula,* a kind of Diatom or vegetable organism which abounds in comparatively still and brackish waters. According to physiologists the intestine passes the heart without coming into contact with it, being an exception to the general rule with respect to the relative position of these organs in the Acephala. The oyster, therefore, cannot in fairness be twitted with the proverb that the way to the heart is through the stomach. Nor is the idea of its being "crossed in love" less fallacious, seeing that each individual is of both sexes and can only be enamoured of itself. Clark, as well as G. B. Sowerby, asserts that the animal has *two* adductor muscles, and that the corresponding impressions may be seen in each valve, the posterior one being very small and placed close to the hinge. I have not been able, however, to detect more than one impression, which lies nearly in the middle. I would therefore invite the attention of naturalists to the elucidation of this simple point. On it depends the Lamarckian division of the Lamellibranchiata into Monomyaria and Dimyaria, the oyster being the type of the former group. Dr. Fischer says that the adductor muscle in *Pecten* (which is allied to the oyster and belongs to the same group) is divided, so as to form anterior and posterior bundles placed at different angles. He is of opinion that the group of Monomyaria exists only in appearance and not in reality. The cartilage and ligament advance with the growth of the animal, in consequence of which the old layers become useless and are external. The oldest or first-formed portions of the shell cease in time to be occupied by the animal, so that the beaks become disunited and in adult specimens are separated by a wide chasm. The shell is remarkably calcareous, and consists for the most part of layers termed by Dr. Carpenter "sub-nacreous" and having comparatively little adhesion one to another. These layers are internal. The outer layers are composed of prismatic cellular structure, and have no natural cohesion. The weight of the animal in a full-grown example is very disproportionate to that of the shell. The late Mr. Thompson of Belfast ascertained that a large oyster from that bay weighed altogether two pounds, but that the weight of the animal taken out of the shell was only an ounce and a half. Large-sized specimens from the British seas seldom exceed six inches in length; but on the North-American coast this species (if it be the same as ours) is said to attain occasionally twice that size. Young shells are sometimes marked with radiating purple streaks; and now and then one is found attached to the operculum of a living *Buccinum undatum,* the surface of which it completely covers and takes its form.

Before adverting to the economical point of view, I may mention some of the minor uses to which oysters are put. These are few: they serve to keep an aquarium free from the spores of sea-weeds; their shells are burnt as a substitute for lime; and formerly certain medicines were prepared from their calcined material. Also pearls of inferior lustre, often small and of an irregular shape, are obtained from them. Antiquaries tell us that the shells have been discovered in Saxon tombs, and that in still older places of sepulture in the Orkneys they are found drilled in such a manner as to show that they probably formed articles of personal ornament. They must have made a clumsy necklace. But their chief value results from the fisheries, which for more than eighteen centuries have rendered Great

Britain famous as an oyster-store, and continue to give employment to thousands and a delicate and wholesome food to millions. Although Catullus calls the Hellespont "cæteris ostreosior oris," his countrymen always gave the preference to our natives. Some interesting statistics of the trade will be found in the 'British Mollusca.' In a later account of this important branch of our commerce it is stated that in London alone about 700 millions of oysters are annually consumed, and that in the provinces there is equal voracity and constant crying out for more. The consumption in Paris in 1861 reached 132 millions, according to a statistical report of the archostreologer, M. Coste. The preservation of oyster-fisheries has been frequently the subject of legislative enactments in this and other countries. A dispute, which threatened at one time to be serious, arose not many years ago between the French and ourselves as to the limits of such fisheries in the English Channel. It shows the weight that these humble mollusks, insulted in proverbs, but sought after with such eagerness, have in the scale of nations. The same jealousy prevailed lately on the other side of the Atlantic. The Governor of Virginia in 1857 was said to have been in a perpetual stew on this account, and to have sent an urgent "message" or appeal to the Legislature for protection, believing that the idea of an oysterless State was much too gloomy for contemplation! Our Transatlantic cousins boast that their oysters are far superior in flavour to any in the Old World. In the 'Natural History of New York,' published in 1843, it is stated that there were two principal varieties in the then United States—viz. northern and southern—and that connoisseurs pretended to distinguish these varieties by the smell alone. The oyster may have played, although unconsciously, a part in the sad tragedy which has been performed in that unfortunate country, by indicating (like the herald in a Greek play) the approaching separation of the States, with reference to the distinction in its own case into "northern" and "southern." The art of "huitre-culture," which has been practised in France with so much success, is simple as well as useful. It consists of fixing, in sheltered and suitable spots, wooden stakes interlaced with branches of trees, arranged like fascines, on which a few breeding-oysters are laid. At the end of three or four years the stakes are pulled up; the mature oysters are selected for market, the small ones being left to grow and breed; and the stakes and branches are replaced. A similar harvest is gathered in each succeeding year. The preserve or "park" is paved, to prevent an excessive accumulation of mud, which would destroy the fry. Its enclosed and raised position prevents the access of fish and other injurious animals. The German Ocean has been so long the fishing-pond of Europe, that its supplies are beginning to fail us; and we cannot feel too grateful to M. Coste for his ingenious method of replenishing the nearly exhausted stock of oysters. Besides man, the oyster has many enemies; and were it not for its wonderful fecundity, it must long ere this have been extirpated. Starfishes, whelks, and annelids attack and devour the adult; and countless shoals of small fish, bivalve mollusks, and other animals swallow the fry while they are disporting themselves in the brief period of their free and active state.

The oyster is a classical character; and its praises have been said or sung by innumerable writers, from Aristotle to "Professor" Blezard. It furnished Shakespeare with many a playful allusion; and the philosophical question which he makes the fool ask of Lear, as to the mode of constructing its shell, would be difficult for the best conchologist to answer satisfactorily. It has even been celebrated in pastoral verse. Sannazarius, an eccentric Italian writer of the last century, changed the scene in this kind of poetry from woods and lawns to the barren beach and boundless ocean, introducing sea-calves in the room of kids and lambs, seamews for the lark and the linnet, and presenting his mistress with oysters instead of fruits and flowers. There is no lack of gossip on the subject. The recent publication of three books attests its popularity. One contains the "Life of an Oyster"; another gives directions "where, how, and when to find, breed, cook, and eat it"; and the third explains its medicinal and nutritious qualities. All these brochures are very amusing. The second teaches no less than fifteen different ways of dressing this delicacy; and it would especially interest those who are not true lovers of it in its natural state, and therefore approve of Gay's sentiment—

"The man had sure a palate covered o'er
With brass or steel, that on the rocky shore
First broke the oozy oyster's pearly coat,
And risq'd the living morsel down his throat."

But there is death even in the pot; and the 'Comptes Rendus' for March last mentions some fatal cases of poisoning by green oysters imported into Rochefort from Falmouth. The Editor of the 'Journal de Conchyliologie,' in commenting on this accident, remarks that English copper, in a metallic state, is a product "très-estimable," but less valuable as an article of food. Old Fuller, in his 'Worthies,' says that oysters are the only meat which men eat alive and yet account it no cruelty. Probably, in his time German ladies did not crunch ants between their teeth for the sake of the formic acid, nor Russian ladies swallow little fishes alive in order to tickle their throats. I am told that at St. Petersburg fresh oysters are not reckoned eatable, but that they are kept till they become "high" and have a gamy flavour! One of the many good qualities of the oyster is perhaps not generally known, and it has not been noticed by any popular writer. It is reticence. Colman, in his 'Broad Grins,' says that the tiny page of Lady Erpingham

> "Slipp'd the Dame's note into the Friar's hand,
> As he was walking in the cloister;
> And, then, slipp'd off—as silent as an oyster."

Family III. PECTI'NIDÆ, Lamarck.

Body oval or oblong, compressed: *mantle* having thick edges: *cirri* long and extensile: *gills* reflected: *foot* developed.

Shell spade-shaped, usually inequivalve and inequilateral: *beaks* small, straight, and pointed, with lateral triangular processes like ears or wings: *hinge* toothless: *cartilage* internal, placed in a cavity beneath the beaks and strengthened by a narrow ligament on each side.

The animal has a distinct foot, which is capable of spinning a byssus, or bundle of horny threads, for attachment to other bodies. It is also endued with a peculiar power of locomotion. By a muscular action, analogous to that which is known as systole and diastole, and by repeatedly taking in and expelling a quantity of water, it flits or jerks itself along for a considerable distance although not in a straight line, flapping the valves of its shell inwards like the wings of a bird in full flight. The ventral margins are in front, the beaks are behind, and the less convex valve uppermost. But as the "beak" of a shell is posterior, and that of a bird is anterior, their relative position is reversed, although the motion of each is nearly the same. Even *Pecten pusio* in its younger state, and before it is permanently fixed, is free and can swim about like its congeners. In other respects also this family differs from the *Ostreidæ.* The shell is of a more regular and symmetrical shape, and its hind margin is expanded on each side into the ears or winglike processes above noticed. Its structure is less compact—its composition, according to Mr. Sorby, being "arragonite," while that of the oyster is "calcite." The impression of the great adductor muscle is placed more on one side than in the oyster, where it is almost central. The muscle by which the front edge of the mantle is attached to the shell leaves a conspicuous scar on the inside of each valve. The cartilage and ligament advance with the growth of the animal, in the same way as in the oyster, but more slowly. All the British *Pectinidæ* are ribbed or striate lengthwise. *Pecten similis,* which is commonly smooth, is hardly an exception, for it sometimes has distinct ridges diverging from the beak to the margin of the shell.

Genus I. PECTEN *, Pliny. Pl. II. f. 1.

Body oval: *mantle* fringed with ocelli or eye-like tubercles. Shell more or less inequivalve: *ligament* internal: *muscular scar* nearly central.

The name of this genus is nearly as ancient as that of *Ostrea.* It is very expressive, the shell usually having ribs which are arranged like the teeth of a lady's comb. Sometimes it resembles the expanded frame of a fan. Scallops are especial favourites of shell-collectors and amateurs, on account of their elegant shape and their brilliant and varied hues. The curious organs called "ocelli" or eyelets are supposed by some physiologists to be rather highly organized, and even superior to the so-called eyes of most Gasteropodous Mollusca. More than one hundred of them have been counted in a single individual of some species of *Pecten*. For this reason Poli called the animal *Argus*. These little eyes have a prismatic lustre, and gleam like precious stones which are set round the inside of a casket lined with mother-of-pearl. Their structure has been lately and independently investigated by Grube, Krohn, and Will. Very young shells of all the species are destitute of ribs; and they are nearly rhomboidal, owing to their breadth and the size of their ears being proportionally greater at that stage of growth than afterwards is the case. In consequence of the Scallops being generally attached or sedentary, the upper valve is more deeply and brightly coloured than the lower one.

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* A comb.

Although all the essential characters of the present genus are uniform and do not vary much in the several species, it has been divided by authors into no less than twenty-eight, most of which will be found enumerated in the useful Index of Herrmannsen. In nearly all the British species the upper or left valve is the larger, and is also distinguished from the other by its brighter or deeper hue. In *Pecten maximus*, however, and occasionally in *P. septemradiatus*, the lower or right valve is the larger, and almost or quite colourless. The intensity of colour is supposed to depend on the action of solar light, although it is not wanting in animals living in the abysses of the ocean, which the most attenuated sunbeam has never directly penetrated.

A. Upper valve more or less convex: *hinge-line* ribbed across.

1. Pecten pu'sio*, Linné.

Ostrea pusio, Linn. Syst. Nat. p. 1146. *P. pusio*, F. & H. ii. p. 278, pl. L. f. 4, 5, and li. f. 7.

Body vermilion or yellowish-white with a brown tint, or particoloured: *cirri* numerous, short, and blunt, arranged in from 5 to 7 rows: *ocelli* large and few in number.

Shell varying in shape according to age, being when young considerably longer than broad, and regular, but in its adult state broader in proportion, and distorted or twisted in consequence of its fitting the cavities and sinuosities of the bodies to which it is fixed; in the earlier stage of growth it is almost equivalve, but afterwards the upper valve becomes usually the larger and more convex of the two; sides nearly equal; it is rather solid, and not glossy: *sculpture*, about 70 narrow and sharp ribs which are alternately large and small, crossed by numerous transverse plates, which by their intersection form scales or prickles on the crests of the ribs; the whole surface is exquisitely marked by microscopical longitudinal striæ which diverge from each successive layer of growth; in the fry these striæ only are visible, the ribs not then existing: *colour* reddish, yellowish, brown, or white, or of intermediate shades, variegated by straight or diverging streaks or blotches of some of those tints: *margins* rounded in front and at both sides, and notched or indented by the impression of the ribs; in the young the upper edge of the angle on the right-hand side, which lies under the large ear, has a row of curved spines, which are arranged like the teeth of a saw: *beaks* prominent: *ears* of unequal size, especially in the young, that on the left-hand side of the upper valve and on the right of the lower valve being the largest; all of them are sculptured like the rest of the shell, the ribs diverging from each side of the beak outwards; the right-hand ear of the lower valve is notched at the base, and it is smaller than the opposite one on the left hand of the upper valve, in order to make an opening and passage for the byssus: *hinge-line* straight: *cartilage* short but strong: *ligament* long and slender: *hinge-plate* strengthened by a thick and knob-like rib on each side of the beak, to form the sides of the cartilage-pit: *inside* pearly, microscopically pitted, and sometimes very finely and closely striate lengthwise: *muscular scars* slight. L. 1·65. B. 1·45.

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* A youngster.

HABITAT: Every rocky coast from Shetland to Cornwall, often on oyster-beds, and attached in the adult state by the whole or last-formed part of its lower valve to the inside of old bivalve shells, or to rocks, *Eschara foliacea,* and other substances. The depth of water in which it lives varies from 5 to 85 fathoms, and the young are occasionally found at low-water mark on some shores where the tide retires for two or three fathoms. In a fossil state *P. pusio* occurs in the Clyde beds, as well as in the Red and Coralline Crag. Its extra-British range is considerable, extending from Norway to the Azores on the one side and to the Ægean on the other.

In more northern seas this species soon fixes itself permanently to various bodies by means of an agglutinating secretion; but in the Mediterranean and more southern latitudes it usually remains free, or attached by a byssus only, from which it has the power of withdrawing or disengaging itself at pleasure. In the former or fixed state it belongs to the genus *Hinnites* of Defrance. It has been clearly shown, however, by the late Mr. G. B. Sowerby thirty-five years ago, on conchological grounds, and by Dr. Fischer in 1862, physiologically, that this species is a true *Pecten,* and that the genus *Hinnites* is not maintainable. The peculiar mode of attachment by the shell in this case is the reverse of that adopted by the oyster, the former having the smaller valve and the latter the larger valve uppermost. The prickly scales are sometimes produced also on the lower valve, and become leaf-like or foliated as in the oyster. In fixed specimens the byssal sinus is more or less closed; but I have some of a large size and much distorted, which were attached by a strong byssus as well as adhering by the shell. According to Fischer the foot does not become atrophied or proportionally smaller in the fixed adult, although it is then quite useless for the purpose of locomotion. This fact is opposed to the general idea that the size of organs is modified or affected by a change in the habits of an animal. The present species was first described by Lister with his wonted accuracy. Wallace, in his 'History of the Orkneys,' has an ingenious way of accounting for the shells being so distorted. He calls them the "twisted Pectines of Stroma," and says, "I cannot think the odd strange tumbling the tides make there can contribute anything to that frame; yet after all I never see them in any other place."

It is the *Ostrea sinuosa* of Gmelin and the *P. distortus* of Da Costa. In its younger state it is the *P. multistriatus* of Poli, and the *P. Isabellæ* of Macgillivray but not of Lamarck.

2. P. VA'RIUS*, Linné.

Ostrea varia, Linn. Syst. Nat. p. 1146. *P. varius*, F. & H. ii. p. 273, pl. L. f. 1.

Body pale red, pink, brown, or yellow, sometimes mottled with white or streaked with purplish-brown: *mantle* broad-edged: *cirri* numerous, of unequal length but mostly long and slender, arranged in four rows: *ocelli* about 30, black, and smaller than in the last species: *foot* rather large, thick, and white.

Shell transversely oval, much broader in front than behind, nearly equilateral, rather solid and slightly glossy: *sculpture*, 25–30 smooth and rounded ribs, which are equal-sized; the whole surface is also covered transversely with fine plates, which often form vaulted spines on the crests of the ribs; the interstices of the ribs are marked with minute bifurcating striæ: *colour* red, pink, yellow, purple, brown, and rarely milk-white, with streaks or blotches variously disposed: *margins* rounded in front and at the sides, and notched or indented by the ribs, sloping abruptly to the beak on each side from a little above the middle; upper side of the slope on the right hand of the lower valve toothed or serrate as in the last species: *beaks* prominent: *ears* unequal and formed as in *P. pusio*; the right-hand one of the lower valve projects beyond and slightly overlaps the opposite ear of the upper valve; their markings and the byssal notch are the same as in the last species, as well as the *cartilage*, *ligament*, and internal structure; but the *muscular scars* are more distinct. L. 1·85. B. 1·65.

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* Variegated.

Var. 1. *purpurea.* Shell larger, broader, and flatter: *colour* purplish-brown marbled with yellow.

Var. 2. *nivea.* Shell of the same shape as the last variety, and having about 45 ribs: *colour* snow-white, sometimes tinged with purple, or more rarely orange, yellowish, purple, or brown of different shades. *P. niveus*, Macgillivray, Edinb. Nat. & Phil. Journ. xiii. p. 166, pl. 3. f. 1; F. & H. ii. p. 276, pl. L. f. 2, and (animal) pl. S. f. 3.

HABITAT: Equally common with the last species, and in similar situations; but it does not appear to have been found on these coasts north of the Orkneys, whence a white variety has been procured by the Rev. Dr. Smith of Old Aberdeen. The range of depth varies from low-water-mark at spring-tides to 40 fathoms. Var. 1. Falmouth harbour and off Portsmouth (J. G. J.); Cork harbour (Humphreys); Bantry Bay (Barlee). Var. 2. Western coasts of Scotland, in 3–25 fathoms, on *Laminaria saccharina* and occasionally attached to stones; Glengariff, Bantry Bay (Barlee). As a fossil or subfossil this species is found in the upper tertiaries of the Belfast, Clyde, and Sussex beds. Abroad it is distributed in every sea from Bergen (Sars) to the Ægean (Forbes); and according to Weinkauff it is not uncommon on the Algerian coast.

In the north of France it is called "Petite-Vanne"; and Collard des Cherres says that it is eaten in Brittany, as well as other kinds of scallops. The pallial tentacles or cirri of the variety *nivea* are extremely interesting and beautiful objects. They are of different colours in the same individual—white, yellow, and brown—and are sometimes edged with black or purple. Some of them are much longer than others, and each has a white line or streak down the middle. The longest have a few milk-white specks, and their tips are curled like a crosier. A few of these tentacles are three-quarters of an inch long. All are contractile and extremely sensitive. The outermost row folds back over the margins of the shell. The edges of the mantle are studded with papillæ. The ocelli do not correspond in number or position with the ribs of the shell, there being two eyelets for every three ribs. All the specimens (about twenty in number) examined by me on the 1st of September 1862, at Oban, shed from time to time a milky fluid which I found was entirely composed of spermatozoa. These moved actively about in every direction and spread in the water like a thick mist. The quantity emitted by each individual was very great, and after every discharge the water became more turbid. All these specimens had ovaries of a pale-yellow or cream colour. This seemed to me a sufficient proof of the monœcious character of the Scallop; and it showed that the mode of its fecundation is the same as takes place in many plants—only substituting spermatozoa for pollen-dust, and the waves for the wind or winged insects. A quarter of a century ago, when this pretty variety was not easily procurable and therefore exceedingly rare, a specimen fetched £2. Fifty or more may now be had for the same price. I have the fry attached to a rib of *Rissoa parva*, showing that they remove from place to place, at least in the earlier stages of growth. The hooded crow is very fond of these scallops. It takes one from the tangle at low water and carries it to the shore or a bank, on which it drops its prey, watching with cunning patience until the scallop opens its shell. It then quickly thrusts its pointed and strong beak into the gaping valves, forces them asunder, and devours the dainty morsel. Dead and bleached shells are thus often found in places at some distance from the sea, where crows had been feasting. Without this explanation they might have been mistaken for fossils. Specimens of the variety *purpurea* attain a considerable size. One of mine is $3\frac{2}{10}$ inches long and 3 inches broad. This species differs from the younger state of *P. pusio* in being larger, and in the ribs being much less numerous, and equal in size instead of alternately large and small. Being free and of a regular shape at all ages, it is readily distinguishable from the adherent and distorted adult of the other species.

I fear that some of my conchological friends will be terribly shocked at my innovation in uniting *P. niveus* with *P. varius*; but I feel constrained to take this bold step, even at the risk of not being soon forgiven. I had for a long time great misgivings on the subject; but it was not until I had most carefully examined and compared a multitude of specimens of both these so-called species, collected from various and distant places, that I was able to arrive at a satisfactory conclusion. The only points of difference between *P. varius* and *P. niveus* consist in the latter having a broader and flatter shell with more numerous and delicate ribs, and in the colour being white. All these characters are combined or blended in specimens of *P. varius* and what I consider to be its two principal varieties. Some are broader and flatter than others: the number of ribs varies from 27 to 45, and consequently in their comparative fineness; and the white of *P. niveus* is sometimes beautifully tinted with purple, and passes into different shades of other colours. I have taken *P. niveus* only in every part of the Hebrides, and I have never seen a single specimen of *P. varius* from that district. In Loch Fyne and at Jura an intermediate variety occurs. A specimen from the former locality has 36 ribs, and one from the latter 32 ribs. I noticed in the collection of M. Martin, at Martigues, a white variety having also 32 ribs. A still more puzzling form was sent to me in 1852 by Mr. Barlee from Glengariff in Bantry Bay, which clearly connects the two species; and the variety *purpurea* forms another link in the chain of specific identity. I believe this varietal difference arises from habitat. The strong and few-ribbed *P. varius* lives on oyster-banks and rough ground on an exposed coast; while the delicate and many-ribbed *P. niveus* is only found in sheltered lochs and arms of the sea, moored by its strong byssus to the upper surface of the broad and smooth fronds of *Laminariæ*. The very circumstance of the latter being confined to a limited district is suspicious as regards its specific distinction. Dr. Gray, in commenting on the species in question (Ann. Phil. no. 59. p. 387), says, "Mr. Macgillivray only compares it with *P. varius*, perhaps not aware that *Pecten Islandicus*, Lam., of which this shell appears to be only a variety, has long been known as a British species." The last-named species, however, has never been found in Great Britain except as an upper tertiary fossil; and it has only a generic resemblance to Macgillivray's shell.

P. Islandicus, Müller, once lived within the area which now constitutes the more northern part of the British seas and nearly the whole of Scotland. It is, however, no longer an inhabitant of our coasts. Dead shells in a semifossil state, but occasionally retaining their beautiful pink colour, are not unfrequently dredged upon both sides of Scotland and off the coasts of Shetland, close to land and also at various distances from it, at depths of from 30 to 80 fathoms. It is not uncommon in pleistocene beds on the west of Scotland and in the Moray Firth. The best explanation I can offer for its never having been found alive in any part of our seas is by suggesting that the ancient sea-bed which it inhabited during some part, if not the whole, of the glacial epoch was afterwards upheaved above the level of the sea, so as to cause the extinction of this and other arctic species, and that at a subsequent period a great part of this district was slowly submerged and is now again covered by the sea. We know that this process of elevation in some and depression in other parts of the Atlantic sea-bed is still going on. Sweden and Greenland are instances of the former phenomenon; and to the latter may be referred the discovery by Dr. Wallich of starfishes belonging to a species which usually inhabits shallow water, living at a depth of 1260 fathoms, as well as the occurrence of *Nassa incrassata* and other littoral kinds of Mollusca in nearly 80 fathoms off the coast of Shetland. *P. Islandicus* survives and is abundant in every part of the Arctic Ocean at depths varying from 15 to 150 fathoms. It has not been recorded as living south of Drontheim; and Malm says that it does not now exist anywhere on the Swedish coast, although it is common there in a fossil state. This species is not unlike the variety *nivea* of *P. varius* in shape and the number of ribs; but the shell is more solid, the ribs sharper, and the surface resembles shagreen.

3. P. OPERCULA′RIS*, Linné.

Ostrea opercularis, Linn. Syst. Nat. p. 1147. *P. opercularis*, F. & H. ii. p. 299, pl. L. f. 3; li. f. 5, 6; liii. f. 7.

Body thick, variegated with pink, cream-colour, fawn, orange, or brown, and mottled with flake-white meandering lines, spots, and blotches: *mantle* thin, except at the fleshy margins: *cirri* conical, white, of unequal length and irregularly disposed in two or three rows, the outer one of which has the longest filaments: *ocelli* 35–40, nearly globose, having pearl-coloured pupils within black circles: *foot* small, subcylindrical, deeply cloven or furrowed, and scoop-shaped at its extremity, of a yellowish-white colour.

Shell circular and equilateral, except at the back (where the periphery is interrupted by the beak and ears), rather thin, scarcely glossy: *sculpture*, about 20 rounded ribs, which are of equal size and somewhat broader than the interstices; the surface is more or less covered with extremely fine and wave-like transverse plates, which often form numerous rows of short prickles, especially along the ribs and on their crests, making the shell feel rough as shagreen: *colour* red, pink, orange, yellow, purple, brown, or of intermediate shades, often streaked or marked with blotches or spots, and sometimes (but rarely) milk-white: *margins* rounded in front and at the sides, notched or indented by the ribs, sloping gradually to the beak on each side from about three-fourths of the distance from the front margin; slope below the byssal sinus strongly toothed or serrate: *beaks* prominent: *ears* nearly equal, sculptured by ribs which radiate from the beak; the ears of the lower valve slightly project beyond and overlap those of the upper valve; byssal notch deep: *hinge-line* straight: *cartilage* rather large: *ligament* narrow and slight: *hinge-plate* somewhat broad, minutely striate across; transverse rib strong and raised on each side of the cartilage-pit: *inside* fluted or grooved, so as to correspond with the folds of the outside ribs; each shoulder under the ears is furnished with a thick ledge, which rests on that in the opposite valve, thus giving additional support to the hinge and preventing its being too closely pressed: *muscular scars* distinct. L. 2·35. B. 2·5.

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* Like a cover or pot-lid.

Var. 1. *lineata*. Shell white, with a brown line running down the crest of each rib. *P. lineatus*, Da Costa, Brit. Conch. p. 147, pl. x. f. 8.

Var. 2. *tumida*. Shell more swollen and deeper.

Var. 3. *elongata*. Shell smaller, and longer than broad.

HABITAT: Common on all sandy coasts, and gregarious, in 6–90 fathoms. Var. 1. Not unfrequently found with specimens of the usual colour, and sometimes having a mixed hue. Var. 2. Plymouth (J. G. J.); Exmouth (Clark); Cork (Humphreys). Var. 3. Loch Torridon, Ross-shire (J. G. J.); Birterbuy Bay, co. Galway (Barlee): rare. This species is a common fossil in the Scotch glacial deposits, and in the Norwich, Red, and Coralline Crag. Steenstrup informs me that he has found it in Iceland; Mohr has recorded it from the Faroe Isles, Weinkauff from Algeria, Forbes from the Ægean, and McAndrew from Madeira; and it is widely distributed throughout the intervening seas.

This pretty and well-known species was first described by Lister. Mr. Norman says that quantities are dredged in the Firth of Clyde, where they are called "clams," for bait in the long-line fishery. When cooked they have a rich and agreeable, but peculiar, flavour: they are not much eaten in this country. According to Montagu they are called "frills" or "queens" on the South Devon coast. The fishermen on the Dorset coast call them "squinns." In the north of France this kind bears the name of "vanneau" or "olivette." The shells make pretty pincushion-cases; and in the North-American States another species (*P. concentricus*) is used for the same purpose.

The Rev. Dr. Landsborough has given the following interesting account of their habits in an earlier stage of growth:—"We observed on a sunny September day in a pool of sea-water left on Stevenston strand (Ayrshire) by the ebbing tide, what we at first thought some of the scaly brood at play. On close investigation, however, we found that it was the fry of *Pecten opercularis* skipping quite nimbly through the pool. Their motion was rapid and zigzag, very like that of ducks in a sunny blink rejoicing in the prospect of rain. They seemed, by the sudden opening and closing of their valves, to have the power of darting like an arrow through the water. One jerk carried them some yards, and then by another sudden jerk they were off in a moment on a different tack. We doubt not that, when full-grown, they engage in similar amusements, though, as Pectens of greater gravity, they choose to romp unseen and play their gambols in the deep." The animal of the adult scallop, when at rest, is a study for a painter, with its large and bright pink ovary, and its mantle studded on each side with a row of brilliant eyelets, like dewdrops glittering in the sun of a May morning. The transverse plates form hollow or vaulted scales in young shells; and their surface is minutely and closely tubercled, like the cells of Polyzoa. In the fry the upper valve is much larger than the lower one and overlaps it. The ribs are not then formed, but the byssal sinus is well developed. Specimens from the Firth of Forth and Shetland are much larger than usual, although slightly differing from each other in their relative proportions. I have one from the latter district measuring $3\frac{6}{10}$ inches long and $3\frac{7}{10}$ broad, and another from Portobello $3\frac{2}{10}$ long and nearly 4 broad. Occasional distortions or monstrosities occur.

P. opercularis may be readily known from either of the two foregoing species by its circular form, greater size, and nearly equal ears. The *P. Audouinii* of Payraudeau can hardly be considered a variety. Its sculpture is that of the *P. lineatus* of Da Costa, and only differs from that of ordinary specimens in the scales being more regular and continued across the ribs. The *P. subrufus* of Turton is merely the young state, with a straighter outline. Many other specific names have been invented by authors for still more trifling varieties.

4. P. SEPTEMRADIA'TUS*, Müller.

P. septemradiatus, Müll. Zool. Dan. Prodr. p. 248, no. 2992. *P. Danicus*, F. & H. ii. p. 288, pl. lii. f. 1–2, 7–10.

SHELL nearly circular and equilateral, except as in the last species, thin, somewhat glossy: *sculpture*, mostly 7 rounded but compressed ribs (the middle one being the largest), which are much narrower than the interstices; the surface is covered with minute and close-set longitudinal striæ, which are crossed by equally fine but more remote transverse plates, so as occasionally to form prickles at the points of intersection; the sides are marked with short and stronger striæ, placed at right angles to the longitudinal striæ: *colour* reddish-brown, mottled or streaked with white: *margins* as in *P. opercularis*; slope below the byssal sinus seldom, and never distinctly, serrate: *beaks* prominent: *ears* nearly equal in the upper valve, but not so in the lower valve, in which the right ear is the larger; all of them are sculptured by ribs radiating from the beak, as well as by fine and numerous striæ, which run from the sides or shoulders and diverge outwards; there are also some wavy striæ in the line of growth, crossing the auricular ribs; the ears of the lower valve project beyond and overlap those of the upper valve, but much less than in any of the preceding species; byssal notch slight: *hinge-line* straight: *cartilage* small: *ligament* very thin: *hinge-plate* rather broad, microscopically striate across; transverse rib slight and raised a little on each side of the cartilage-pit: *inside* fluted or grooved as in other ribbed species: *muscular scars* rather distinct. L. 1·625. B. 1·475.

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* Seven-rayed.

Var. 1. *alba.* Shell of a milk-white colour.

Var. 2. *Dumasii.* Shell smaller and more solid, longer in proportion to its breadth; upper valve less convex than the lower one and sometimes quite flat or even slightly concave: *sculpture* coarse, with 3–10 sharp ribs: *ears* often unequal, those on the byssal side smaller than the opposite pair. *P. Dumasii,* Payr. Cat. Moll. Corse, p. 75, pl. ii. f. 6, 7.

Habitat: Rather plentiful in Loch Fyne, and generally distributed over our northern seas, and southward as far as the Northumberland coast, in 20–90 fathoms, rough ground. Var. 1. Loch Fyne and Shetland (Barlee). Var. 2. Hebrides and Shetland. This species is fossil in the Clyde basin, and in other glacial deposits in Scotland as well as Norway. It ranges from Finmark to the Ægean, but it appears not to be so common in the south as in the north. The variety *Dumasii* occurs in the upper miocene strata near Antibes.

P. septemradiatus was added to the British fauna by the late Capt. Brown in 1835. It is remarkable that such a handsome and by no means small shell should have previously escaped the notice of Laskey, Fleming, Macgillivray, and others of our northern conchologists. This can scarcely be accounted for by the dredge not having been used in those days, because specimens are usually procured from fishermen. They are frequently caught in the herring-nets, when disturbed on their feeding-grounds and swimming or flitting about. I am not aware that the animal has ever been described; and I have unfortunately missed the opportunity of observing it. Asbjörnsen mentions his having taken specimens in the beginning of May, which were full of a milky fluid. The shell is extremely variable in respect of shape and the number of ribs, as well as of the proportionate size of the ears. A single valve which I dredged off Skye in 1847 somewhat resembles Philippi's var. η. of *P. polymorphus*; the front of each valve is folded inwards and grooved, with the inside margin finely notched or crenulated. In young shells the surface is regularly cancellated. The fry is glossy and has very prominent beaks; its sculpture consists of numerous microscopical longitudinal striæ on the upper valve, and equally minute transverse striæ on both valves.

A dozen names have been given by different conchologists to this species. If the authority of O. F. Müller, the original discoverer, were at all questionable, Gmelin's name of *hybridus* would have the priority over that of *Danicus*, which was proposed by Chemnitz nineteen years after the publication of the Prodromus to the 'Zoologia Danica.'

P. glaber of Pennant and Montagu is a well-known Mediterranean species; and there does not seem to be any reason for supposing that it ever inhabited the Welsh or Scotch coasts, as stated by those authors.

I have a single valve of *P. sulcatus*, Müller, which was dredged off the east coast of Shetland by Mr. Barlee; but as it is an imperfect specimen, I do not at present describe this species as British, but merely offer a short notice of it. It has thirty-two ribs, besides small intermediate ones; they are rounded and cord-like, with thin transverse plates in the interstices. The colour of my specimen is orange-yellow. The ears are proportionally larger than in *P. septemradiatus*. The inside is marked by furrows, which correspond with the ribs as in *P. glaber*. The species now noticed inhabits the Scandinavian seas. A small single valve, in a semi-fossil state, was taken by Capt. Hoskyns at a depth of

340 fathoms, in his recent soundings off the west coast of Ireland. In consequence of the specific name (*sulcatus*) having been preoccupied by Born for a very different kind of scallop from Malabar, the name proposed by Müller is inadmissible; and Gmelin made a better hit than usual in changing the name of the northern shell to *aratus*. Lamarck carelessly applied the same name of *sulcatus* to another species of *Pecten* which is common in the Mediterranean. It is possible that the *P. 20-sulcatus* of Müller may be a variety of his *P. sulcatus*; and in that case the first of these names ought to be adopted in preference to that given by Gmelin.

5. P. TIGRI'NUS*, Müller.

P. tigerinus, Müll. Zool. Dan. Prodr. p. 248, no. 2993. *P. tigrinus*, F. & H. ii. p. 285, pl. li. f. 8–11.

BODY bright red or occasionally creamy-white: *mantle* edged with white and mottled with dusky or brown rays: *cirri* short: *ocelli* 10, brown with a golden centre: *foot* white and very flexible: *byssus* transparent.

SHELL of the same shape as the last two species, but rather narrower at the back, moderately solid, and somewhat glossy: *sculpture*, extremely fine and numerous impressed striæ, which radiate from the beak and gradually diverge to the front and side margins; these striæ are not visible to the naked eye, and under a strong magnifier they appear regularly but slightly punctured in consequence of the intersection of equally minute and close-set transverse striæ, which follow the line of growth; the longitudinal striæ are sometimes irregularly waved or interrupted, and are often forked: *colour* yellow, brown, or purple, and now and then white, with variously disposed bands, streaks, blotches, spots and other markings of those hues: *margins* rounded in front, so as to form a semicircle, and sloping from near the middle to the beaks at an angle of about 45 degrees; the front margin is sometimes folded inwards and strongly notched; the upper part of the slope below the byssal sinus is finely toothed: *beaks* very prominent and considerably raised: *ears* unequal: those on the left hand of the upper valve and right hand of the lower valve are at least four times the size of the others; all of them have a few strong ribs which radiate from the beaks, and they are also marked with coarse and numerous striæ which cross the ribs obliquely: the ears of the lower valve project very little beyond those of the upper valve; byssal notch deep: *hinge-line* straight: *cartilage* small: *ligament* very thin: *hinge-plate* narrow, microscopically striate across; transverse rib strong and considerably raised on each side of the cartilage-pit: *inside* nacreous, finely and closely striate lengthwise and notched on the front margin; within the larger ears are strong grooves which correspond with the outside ribs: *muscular scars* distinct, especially in aged specimens. L. 0·9. B. 0·885.

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* Barred like a tiger.

Var. *costata*. Shell stronger than usual, and having either five ribs and intermediate small ones, or else several riblets of equal size: *inside* grooved and striate accordingly.

HABITAT: Not uncommon from Shetland to the Channel Isles in 7–82 fathoms, on a sandy bottom mixed with gravel; and the variety is equally diffused. This species occurs as an upper tertiary fossil in the Scotch glacial deposits, and also in the Red and Coralline Crag. It is a native of the Icelandic and Scandinavian coasts; and Mr. M'Andrew has taken it in Vigo Bay at a depth of only 8 fathoms.

The shell varies greatly in size and proportions, as well as in colour and the number of ribs. My largest specimens are one inch and two-tenths long, and nearly the same in breadth. Sometimes the breadth slightly exceeds the length. Young shells are proportionally longer than old ones. In the former the so-called "eyes" are perceptible through the semitransparent shell many years after the animal has ceased to exist. The fry are not sculptured, but perfectly smooth; and the lower valve is nearly flat and smaller than the other. Müller noticed the way in which he presumed this scallop procures its food, viz. by rapidly opening the valves of its shell and clapping them together with an audible noise ten or twelve times in succession. It then kept them wide open and for a much longer time than suited the patience of the great zoologist. By this violent agitation of the water a fresh supply of animalcula may be brought to its insatiable maw. He adds that it can squirt the water out of a vessel half an ell high; but I have never seen it perform such an extraordinary feat. The jet of water would be at least fifty times the length of the animal.

A slight and pardonable liberty has been taken in changing the original spelling of the specific name from *tigerinus* to *tigrinus*. This shell was called *P. parvus* by Da Costa, *P. domesticus* (used of course in the sense of native) by Chemnitz, and *P. obsoletus* by Pennant.

6. P. TESTÆ*, Bivona.

P. Testæ. (Bivona) Philippi, Moll. Sic. i. p. 81, t. v. f. 17. *P. furtivus*, Lov. Ind. Moll. Scand. p. 31.

SHELL somewhat resembling *P. tigrinus* in shape, but rounder and much more depressed, rather thin and glossy: *sculpture*, minute longitudinal and transverse striæ, which are arranged as in the last species, but they are more regular and never forked; they are deeply punctured at the points of intersection; sometimes there are also from 30 to 35 delicate ribs, which become scaly or prickly where they are crossed by the transverse striæ: *colour* yellow, orange, brown, purple, pink, or occasionally white, usually diversified by streaks, rays, blotches, spots, diagonal lines, and other markings of the above hues: *margins* rounded in front, and forming an arc of two-thirds of a circle in consequence of the lateral slopes towards the beaks commencing higher up than in *P. tigrinus*; byssal slope finely toothed: *beaks* prominent but not much raised: *ears* unequal, those on the byssal side being about twice as large as the other pair; all of them have several fine ribs, which radiate from the beaks and are crossed by coarse flexuous striæ; the edges of the ears on the lower valve project very slightly; byssal sinus deep: *hinge-line* straight, finely notched or serrate at its edge: *cartilage* rather large: *ligament* extremely slight: *hinge-plate* very narrow, microscopically striate across; transverse rib slight, and not much raised on each side of the cartilage-pit, which is proportionally more open than in any of the foregoing species: *inside* slightly nacreous, finely and closely striate lengthwise, or furrowed when the outside is ribbed; margin sometimes notched or crenulated: *muscular scars* indistinct except in aged specimens. L. 0·575. B. 0·55.

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* Named in honour of Sr. Testa, a conchologist at Panormo in Sicily.

Var. *suborbicularis*. Shell larger, with the slope much higher than usual, and considerably narrower behind: *ears* smaller. L. 0·7. B. 0·7.

Habitat: Shetland, Skye, Larne (co. Antrim), Birterbuy Bay (co. Galway), Guernsey (J. G. J.); Exmouth (Clark); in gravelly sand, 18–80 fathoms. It is a rare species. The variety is remarkable. I obtained only a single valve by dredging off the north coast of Shetland in 86 fathoms. Although of much smaller size, this variety resembles in shape and other respects the *P. Gerardii* of Nyst, one of our Coralline Crag fossils. The foreign range of *P. Testæ* extends from Norway to Algeria and the Ægean. Asbjörnsen gives the depth at which it is found in Christiania fiord as 10–20 fathoms.

This beautiful species differs from *P. tigrinus*, with which it is sometimes found, in the following particulars. The shell is broader, flatter, and thinner; the ribs, when they occur, are scaly or prickly; the punctures are very strongly marked and arranged in squares; the beaks are much less prominent and raised; the ears are not so unequal; and the inside margin is seldom crenulated. Forbes and Hanley considered it to be a variety of *P. striatus*; but Malm has satisfactorily shown some of the points of difference between these two species. I have never seen an intermediate form, although I have examined many hundred specimens of *P. striatus* and about fifty of *P. Testæ* with a view to the comparison. The present species has some of the sculpture of *P. tigrinus* and the shape of *P. striatus*. The colouring of *P. Testæ* is more bright and vivid than that of the other two. Some specimens are perfect gems. Mediterranean examples are usually much smaller than those from the North Atlantic, although I have seen several of a tolerable size which were collected by Sr. Costa at Naples. Mr. Clark's specimen from Exmouth, in my collection, was mixed with *P. tigrinus*; and I am rather surprised that his habit of close observation did not enable him to separate them.

It is probably the *P. incomparabilis* and *P. vitreus* of Risso; but his love of species-making seems to have been so inveterate, and his collection is in such a deplorable state of confusion, that it is almost hopeless to attempt any identification of his names. The *P. vitreus* of Chemnitz is quite a different species, as Philippi has well observed.

7. P. STRIA'TUS *, Müller.

P. striatus, Müll. Zool. Dan. Prodr. p. 248, no. 2994; F. & H. ii. p. 281, pl. li. f. 1–4, and (animal) pl. S. f. 2.

Body whitish, irregularly streaked lengthwise with opaque white lines: *mantle* edged with white and having an outer fringe of extensile white cirri: *ocelli* 25 in number, blue-black with crimson centres; behind them is an inner fringe of short white cirri: *gills* also furnished with 20 reddish-brown ocelli, each of which surmounts the crest of a leaflet.

Shell resembling that of *P. Testæ* in shape; but it is rather larger, thinner, and more fragile, and the *sculpture* (especially of the upper valve) is very different. In the present species it consists of numerous fine ribs, which radiate from the beaks to the front and side margins, and have their crests thickly set with short vaulted spines or prickles; besides these riblets, the surface is closely covered with extremely minute and irregular longitudinal striæ, which are raised and divaricate or become forked, but they are never reticulated or punctured as in *P. Testæ*. The *colour* is of a more sombre hue. The left *ear* of the upper valve hangs down much lower, and is nearly entire instead of being deeply notched as in that species; and the byssal sinus is consequently larger. L. 0·725. B. 0·7.

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* Striate.

HABITAT: Seas of Shetland, Scotland, north-eastern coasts of England, north, east, south, and west of Ireland, Isle of Man, and Scilly, in 12–90 fathoms, hard ground. Mörch has procured it from the Faroe Isles, and Danielssen from West Finmark. It also inhabits other parts of the Scandinavian coast. M'Andrew has dredged it in Vigo Bay at a depth of 15 fathoms, and Philippi describes it as a Calabrian fossil under the name of *P. rimulosus*.

The shell is sometimes distorted. The pallial ocelli or eyelets are of unequal size and irregularly placed; they gleam with an opaline lustre. Living specimens which I dredged in 85 fathoms had the shells highly coloured and streaked. Mr. Norman has noticed, in his list of Clyde Mollusca, that the shells of this species lose the azure-blue colour after being kept in a closed cabinet. This is remarkable, because certain colours of shells and other animals (*e.g.* pink and reddish-brown) fade, and even vanish, unless the light is excluded. In the British Museum it has been found necessary to replace, every two or three years, fresh specimens of many delicate-tinted butterflies exposed in the show-cases; and in the museum at Amsterdam the shells are always kept covered to prevent loss of colour. *P. striatus* attains a greater size than *P. Testæ*. My largest specimen is about an inch long, and a trifle more than nine-tenths of an inch in breadth. The striæ in the present species are *raised* and irregular; and they are never punctured or reticulate. In the other species the striæ are *sunk* or impressed and regular, and they are strongly punctured or reticulate. The different substance of the shell, the style and intensity of coloration, and the comparative size of the left ear of the upper valve are also notable marks of distinction. Even the fry of each species exhibits its own peculiar characters.

It is the *P. fuci* of Gmelin, *P. reticulatus* of Chemnitz, *P. Landsburgi* of Forbes, and *P. aculeatus* of myself.

8. P. SI′MILIS*, Laskey.

P. similis, Lask. Mem. Wern. Soc. i. p. 387, t. viii. f. 8; F. & H. ii. p. 293, pl. lii. f. 6, and (animal) pl. S. f. 1.

BODY very variable in colour, often pale yellow or whitish with brown streaks and blotches: *mantle* fawn-coloured with patches and lines of orange and black: *cirri* short; some are white and others brown, a few being thicker and longer than the rest and mottled with milk-white: *ocelli* 6–8 in front and nearly twice as many in a second row behind; the former are comparatively larger, pearly, and ringed with jet: *foot* of a brilliant orange-colour or white.

SHELL nearly circular but expanding towards each side, where it forms an obtuse angle, and rhomboidal behind in consequence of the projection of the ears, equilateral, depressed, extremely thin and rather glossy; lower valve considerably smaller than the other, and to some extent enclosed within it: *sculpture*, fine and close-set concentric lines only: *colour* yellowish or milk-white mottled with reddish-brown or flake-white spots or streaks, and often marked by longitudinal white rays or transverse zigzag lines of a Vandyke pattern: *margins* very thin, semicircular in front and sloping about halfway on each side at an angle of 45 degrees to the beaks; byssal slope not toothed or serrate: *beaks* small but prominent: *ears* long and drooping, nearly square-set, those on the byssal side being the smallest, rounded at the corner; byssal notch slight: *hinge-line* straight, two-fifths of the breadth of the shell: *cartilage* small: *ligament* so thin as to be almost imperceptible: *hinge-plate* broad and smooth; transverse rib slight and scarcely raised: *inside* pearly, minutely striate lengthwise: *muscular scars* distinct. L. 0·285. B. 0·3.

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* Like the fry of *P. maximus*.

Habitat: Sparingly occurring, although gregarious, on all our coasts, in muddy sand at 2–82 fathoms. Glacial deposits, Fifeshire (Fleming); Coralline Crag (S. Wood). Its distribution extends from Finmark to the Ægean; and both in northern and southern localities it appears to have a considerable range of depth, viz. 15–200 fathoms, Upper Norway, according to M'Andrew and Barrett, and 27–185 fathoms in the Ægean, according to Forbes. Norwegian specimens collected by Professor Sars are of an extraordinarily large size.

The animal, as well as the shell, of this tiniest of scallops is very lovely. If, when fresh caught, put into a glass of sea-water, it flits about like a bat for a long time, and then fastens itself to the side of the vessel by a fine and almost transparent byssus. After a while it slips its cable and resumes its voyage of discovery, until it becomes apparently exhausted by the fruitless search and lies down on one side. My largest specimen measures only 0·35 by 0·375. The breadth invariably exceeds the length.

For the discovery of this species science is indebted to the late Capt. Laskey, although he described and figured it from a right valve only, not having at that time obtained a perfect specimen. It is the *Ostrea tumida* of Turton, *P. pygmæus* of Von Münster, *P. minimus* of Sars, *P. Actoni* of Von Martens, and *P. Foresti* of Martin. The *P. Grœnlandicus* of Sowerby (*P. vitreus* of Dr. Gray but not of Chemnitz) resembles the present species in nearly every respect but that of size. It may be an arctic variety of *P. similis* or (more probably) a direct and 'pur-sang' descendant from the original stock.

B. Upper valve nearly flat and concave towards the beak: *hinge-line* ribbed obliquely.

9. P. MAX'IMUS *, Linné.

Ostrea maxima, Linn. Syst. Nat. p. 1144. *P. maximus*, F. & H. ii. p. 296, pl. xlix.

Body pinkish-white above and bright red or pink in front: *mantle* variously marbled with brown, black, and white: *cirri* on the inner margin of the mantle short, white, and arranged in a single row; those on the fixed or exterior margin are of different lengths and arranged in three irregular rows: *ocelli* of a greenish-blue or purplish hue, forming two rows, and numbering from 30 to 35; those in the front row are considerably larger than the rest, and correspond with the ribs of the shell: *foot* snow-white, short, grooved, with a spatulate extremity.

Shell nearly circular, except behind, where the projecting ears give a square outline, equilateral above and nearly so beneath; upper valve slightly raised in the middle, and smaller than the lower valve, which is very convex; it is thick and solid, glossy in the umbonal region but elsewhere of a dull hue: *sculpture*, 15 or 16 ribs in each valve, which radiate from the beaks, and are strong, and nearly as broad as the interstices between them; the ribs and interstices are scored by a few parallel striæ, which are more numerous on the lower than the upper valve; the whole surface is covered with minute and close-set thin concentric plates, which are imbricated or overlap one another like roof-tiles: *colour* reddish-brown on the upper valve, with a yellow tint on the lower valve; both valves are sometimes beautifully mottled or marked with bands, zigzag streaks, and spots of burnt umber, or bright yellow suffused with a delicate pink hue; occasionally, but rarely, the colour is white, with an orange tint at the beaks: *margins* semicircular in front and sloping at the distance of about one-fourth from the hinge-line at an angle of 30 degrees to the beaks; byssal slope not notched or serrate: *beaks* small and not prominent in full-grown specimens: *ears* exactly equal on the upper valve and nearly so on the other valve, furnished with a few ribs or striæ which radiate from the beaks; byssal notch closed in the adult state: *hinge-line* straight, rather more than half the breadth of the shell: *cartilage* large, thick, and strong: *ligament* narrow and rather slight: *hinge-plate* broad, closely and microscopically striate across; transverse rib strong and raised on each side of the broad cartilage-pit; in the lower or deeper valve are two or three short oblique ribs, which diverge from above the cartilage-pit towards the sides in wave-like lines: *inside* glossy, tinged more or less deeply with reddish-brown, fluted as in *P. opercularis*, and having similar shoulders or ledges on the posterior slopes to prevent contact at the hinge-area: *muscular scars* well marked, especially on the upper valve. L. 4·5. B. 5.

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* Largest.

HABITAT: Nearly everywhere, and often gregarious on banks, in 7–78 fathoms. It is also not uncommon in all our upper tertiaries, both new and old. Its foreign range comprises all the sea-bed lying between Norway and the Canaries; and, according to Sars, it occurs with arctic shells in the "postglacial" beds of Christiania.

If the oyster is the king of mollusks, this has a just claim to the rank and title of prince. In Lister's time they were held in nearly the same esteem; and the great scallop is even preferred by some, although from its luscious quality it is not so provocative of appetite. I have not heard of its being eaten raw in this country. In the fish-markets of the north of France it is called "grand'-pélerine," "gofiche," or "palourde." In the south of England it shares with *P. opercularis* the name of "frill," and in the north that of "clam." According to Athenæus, this or an allied species (*P. Jacobæus*) was used by the ancients for medicinal purposes, as well as for food. Old fishermen have a notion that it is taken in greater quantities after a fall of snow; but, if true, this is difficult of explanation, because a scallop never burrows or lives anywhere but on the surface of the sea-bed. They used to be plentiful in Lulworth Bay on the Dorset coast; but now they are rarely found alive. I was told that the breed had been exterminated there by an epicurean officer of the coast-guard. The late Major Martin would allow any conchologist to dredge as much as he pleased in the bays of the Connemara coast, provided he only took useless shells, such as *Tellina balaustina*; but all the big clams (*P. maximus*) were reserved for the table at Ballynahinch Castle. This kind of preserve would be much less expensive to keep than a good pheasant-cover or a well-stocked moor, and it would not be so liable to be poached. Nor were the shells less prized in the days when Ossian sung. The flat valves were the plates, the hollow ones the drinking-cups of Fingal and his heroes, and "the joy of the shell went round." The animal of *P. maximus* has long attracted the attention of naturalists. As Mr. Clark observed, "When the valves are opened, and the mottled surfaces of the double margins of each valve are in conjunction, and the various circles of filaments and cirri fully exserted in a shallow basin of sea-water, it is scarcely possible to conceive a more beautiful and interesting appearance." The animal is small compared with the size of the shell. This is also the case with other kinds of *Pecten*; and it may be owing to the expansibility of the organs, which require much space for their action. Donovan mentions a strange idea, which was entertained by "modern as well as ancient authors," that the way in which scallops leap or raise themselves up is by forcing the under valve against whatever they lie upon! Shells sometimes attain an enormous size. Dr. Landsborough says he measured one which was 8 inches long. I have another specimen that is barely $\frac{1}{25}$th of an inch in length. The young are attached by a byssus. They are quite smooth; and in the place of ribs a few fine white lines radiate from the beaks, as is not unfrequently seen in *P. similis*. This might be considered by the advocates of a theory, which was once put forward in the 'Vestiges of Creation,' a case of arrested development as regards *P. similis*; but they ought to be aware of the fact that both these species of every age inhabit the same spots and yet retain their own distinctive characters. One species never grows or merges into the other. The young of *P. maximus* may be known from *P. similis* of the same size by the upper valve in the former being flat, and in the other convex, as well as by the inequality of the ears in the first-named species. It bears a considerable resemblance to a young *Avicula*, and shows the affinity which exists between that genus and the *Pectinidæ*. The adult seem not to have the power of spinning a byssus, nor to have any occasion for it. Their solid shells can withstand a good deal of buffeting by the tide; if they were slighter, they would require the cable of a *Pinna* to hold them on their anchorage-ground. The substance of the shells is very durable. I have had some of the deep valves in frequent use during the last eighteen years for scalloping oysters; and although they must have been baked in an oven at least five hundred times, they are as perfect and serviceable as ever. The prettiest specimens come from Dublin, Cork, and the Channel Isles.

This species belongs to the genus *Vola* of Klein. The young is the *P. lævis* of Pennant and the older British conchologists.

P. Jacobæus (the famous "pilgrim" scallop) was at one time erroneously supposed to be a native of these seas. It is common in the Mediterranean, and M. Macé has lately included it in a list of shells which he has found at Cherbourg. It is distinguishable from the present species by the ribs of the lower valve being angular instead of rounded.

Genus II. LIMA*, Bruguière. Pl. II. f. 2.

Body oblong: *mantle* not furnished with ocelli.

Shell equivalve: *cartilage* external: *muscular scar* placed on one side.

Lima and *Pecten* have nearly the same characters; but the value or importance of generic, as well as of specific differences is comparative and varies in each case. In the present genus the animal has a bright uniform colour, while the shell is always white. Both animal and shell in the other genus are more highly favoured in this respect and exhibit various hues. The former has its mantle studded with numerous eyes like the tail of a peacock, and looks down upon its cousin as a poor blind creature. The *Lima* moves or rather darts through the water like a scallop, but in a contrary posture. The hinder instead of the ventral end is in front, so that the mode of its progression may be compared to that of a fish swimming tail foremost. Some species construct dwelling-places called "nests" out of fragments of shells, nullipores, gravel, and other material, which they ingeniously fasten together by their byssal threads and attach to the roots of large seaweeds. Several young ones often occupy the same nest or case; but when they become adult each individual has a house of its own. This remarkable construction is funnel-shaped with the larger end contracted, and sufficiently wide to admit of the *Lima* moving freely up and down, but not turning round in it. Here it lives, secure from prowling fish and crabs. The case is lined inside with a closely-woven net of byssal threads, plastered over with slime or excrement. This smooth and soft lining contains a quantity of Diatom-cells, and yields a rich harvest to those who collect these exquisite organisms for microscopical examination. Such remains of perpetual feasts remind one of the similar exuviæ which are found at the bottom of a spider's web. No species of *Lima* is noticed in Dr. Gould's 'Invertebrata of Massachusetts,' or in any other work on the conchology of the United States; nor has Dr. Philip Carpenter, in his elaborate list of the Mollusca inhabiting the north-west coast of America, enumerated any as belonging to the northern fauna of that extensive district.

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* A file.

The very ancient genus *Plagiostomus* of Lhwyd (*Plagiostoma* of Sowerby's 'Mineral Conchology') is considered by some palæontologists to be identical with the present genus. It may be connected with it through the genus *Limea* of Bronn, and form a passage to *Spondylus*. Poli used the name *Glaucus* for the animal of the present genus.

A. Shell equilateral, with a straight outline.

1. LIMA SAR'SII[*], Lovén.

Limea Sarsii, Lov. Ind. Moll. Scand. p. 32.

BODY milk-white: *mantle* set with large, thick, and ringed, but not numerous cirri or tentacles.

SHELL roundish-oval, slightly oblique, convex, rather solid but semitransparent, glossy: *sculpture*, 25–30 raised concentric plates or laminæ, which are imbricate and partly overlap one another in succession, the distance between them increasing in proportion to the period of formation, so that the earliest ones lie close together; these plates are crossed by about the same number of slight ribs, which give the surface an imperfectly cancellated appearance: *colour* white: *margins* rounded, except at the hinge: *beaks* small, straight and blunt, projecting beyond the dorsal margin: *ears* very small and indistinct: *cartilage* small, placed in a shallow triangular pit, which is perpendicular instead of horizontal as in the last genus: *hinge-line* short and straight: *hinge-plate* narrow, bluntly but distinctly crenulated across: *inside* pearly, grooved by the reflection of the ribs and strongly crenate or notched within the front margin: *muscular scars* slight. L. 0·125. B. 0·1.

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[*] Named in honour of Professor Sars, an eminent Norwegian zoologist.

HABITAT: Shetland, in 85 fathoms, with *Limopsis aurita* and other rare mollusks. This remote cluster of our sea-girt isles, which with their craggy fastnesses guard

> "The unadornéd bosom of the deep,"

has yielded more novelties of the highest interest to marine zoologists than any other part of the British coasts. My friend Mr. Waller detected two fresh valves in some gravelly sand which I dredged in 1862 and sent to him for examination; and I found another specimen this year on the same ground. The species was first discovered by Professor Sars at Bergen, and described by Professor Lovén. Danielssen found it at Vadsö, in 40–80 fathoms, and Lilljeborg at Christiansund. It is rare.

In consequence of the hinge-plate in certain fossil species of *Lima* being partly toothed or crenulated, the late Professor Bronn proposed in 1831 to make of them a new genus, which he called *Limea*; and in the following year Münster described the same genus under the name of *Limoarca*. Bronn remarks that, but for its having only one muscular impression, this genus could scarcely be distinguished from *Limopsis*. The species which he noticed were five in number, viz. two from the lias and lower oolite, and three from tertiary strata. But in giving the *Ostrea strigilata* of Brocchi as the type of his genus *Limea*, he seems to have misunderstood the Italian geologist, who nowhere mentions the *hinge* of his shell being toothed. The words used by him are, "Il margine delle valve comparisce crenellato tutto all' intorno ; il cardine non è obbliquo come nella precedente (*Ostrea tuberculata*, Olivi) ma sibbene retto, e nell' area del legamento si scorge una fossetta trasversalmente bislunga." Brocchi's species belongs to the section which comprises our *L. Loscombii*. Lovén adopted Bronn's genus for *L. Sarsii*, considering it to be a passage towards *Limopsis*, and says that the mantle of the animal has no cirri ; but Sars, in his account of the Arctic Mollusca on the coast of Upper Norway, has since observed that the mantle of this species is like that of the rest, and set with proportionally large tentacles or cirri which are thick and ringed, although not particularly numerous. According to Searles Wood, some of his specimens of *L. subauriculata* from the Crag have the hinge-plate minutely crenulated. The same character is seen in many species of *Pecten*. These crenulations probably serve for the firmer attachment of the cartilage to the hinge-plate, and not for a separate fastening as in the interlocking teeth of *Arca*. They are too slight for the last-mentioned purpose. Norwegian specimens of *L. Sarsii* are much larger than ours. This and the next two species form a distinct section, which Klein more than a century ago called *Ctenoides*, and for which Searles Wood has proposed the subgenus *Limatula*.

2. L. ELLIP'TICA*, Jeffreys.

L. subauriculata, F. & H. ii. p. 263 (partly), pl. liii. f. 4, 5.

BODY pale orange: *tentacula* pale pink: *foot* pale orange. (F. & H.)

SHELL oval or elliptical, convex, slightly and almost equally expanding towards the sides, thin and glossy, semitransparent: *sculpture*, 30–40 fine longitudinal ribs, which become very faint and indistinct as they approach the sides; one of these ribs, near the middle but more towards the posterior side, is rather larger than the rest, and a corresponding furrow is formed inside each valve, appearing outside like an oblique white line; the ribs are crossed by extremely delicate and numerous concentric striæ, making the crests beautifully serrate; the substance of the shell also exhibits a few diagonal white streaks or lines, which diverge from the centre to each side: *colour* pearl-white: *margins* broadly rounded in front, and sloping with a gentle but somewhat flexuous curve upwards to the ears, much compressed at the sides: *beaks* extremely prominent and gibbous, projecting considerably beyond the hinge: *ears* triangular, small, erect: *cartilage* diamond-shaped, occupying about one-third of the hinge, and minutely striate across; there is also a very slight and indistinct ligament on each side of the cartilage: *hinge-line* straight except in the middle, where it is incurved to receive the cartilage: *hinge-plate* blunt: *cartilage-pit* forming an obtuse triangle, smooth; under each ear is a shelving triangular space confined below by a narrow rib: *inside* highly nacreous, and marked by a furrow which runs obliquely down the middle, and is the reverse or under side of the larger rib on the outer surface; it is also indistinctly grooved by the impression of the ribs; the front margin is slightly notched by the edges of those ribs: *muscular scar* irregularly circular and distinct. L. 0·55. B. 0·35.

Var. *leviuscula*. Shell nearly smooth, the ribs being wanting.

HABITAT: Sandy mud, in 15–85 fathoms, off the Shetland Isles and west coast of Scotland. It is not uncommon in the latter district. The variety is from

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* Elliptical.

Skye; but although evidently immature, it differs from the young of the typical form in being destitute of ribs. Sars, Lilljeborg, and Malm have taken this species on different parts of the Scandinavian coasts from Bergen southwards, and supposed it to be the *Pecten subauriculata* of Montagu.

It does not appear that this or either of the other species in the present section is a nest-builder. I have often dredged living specimens in every stage of growth, but always found them free. The shell of *L. elliptica* is sometimes covered with Foraminifera and Polyzoa: but this does not prove that they are never enclosed in cases, because shells of *L. hians*, taken alive from their nests, are often thus encrusted.

After much consideration I am satisfied that Montagu's name of *subauriculata* ought to be assigned to the following species and not to the present. His description and figure evidently apply to the other species, which occurs in the same locality that he mentions, viz. the coast of Devon. *L. elliptica* has not, I believe, been found south of the Hebrides. Both live together in the northern part of our seas, as well as on the Scandinavian coast. Their distinctive characters will be pointed out after describing the next species. Forbes and Hanley united the synonyms and localities for the two species; but their description appears to have been taken from a specimen of *L. elliptica*.

3. L. SUBAURICULA'TA *, Montagu.

Pecten subauriculata, Mont. Test. Brit. Suppl. p. 63, t. 29. f. 2.

BODY milk-white: *mantle* clothed with about a dozen tubular clear-white tentacles of different lengths, which are closely ringed and ciliated: *foot* white and cylindrical.

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* Slightly eared.

Shell oblong, extremely convex, rather thin and glossy, semitransparent: *sculpture*, 24 slight but sharp ribs, which radiate from the beaks and do not extend to the sides; the middle rib is the largest, and runs straight down to the front margin; the ribs are crossed by extremely fine and numerous concentric striæ, making the crests appear somewhat jagged: *colour* milk-white: *margins* rounded in front, and sloping with a gentle curve upwards to the ears: *beaks* extremely prominent and gibbous, projecting considerably beyond the hinge: *ears* triangular, very small, hanging a little downwards: *cartilage* diamond-shaped, occupying nearly one-third of the hinge: *ligament* narrow and slight: *hinge-line* straight except in the middle, where it is incurved: *hinge-plate* sharp: *cartilage-pit* forming an acute triangle, faintly striate across; under each ear is a shelving triangular space as in *L. elliptica*, but proportionally narrower: *inside* highly nacreous, and marked by a furrow which runs down the middle, and is the reverse or under side of the central rib; it is also indistinctly grooved by the impression of the outside ribs; front margin slightly notched by the edges of those ribs: *muscular scar* faint. L. 0·275. B. 0·15.

Habitat: Sandy and gravelly ground in almost every part of the British seas, from 18 to 90 fathoms. It is also a Coralline Crag fossil. Its distribution in other parts of the northern hemisphere is very extensive, embracing Greenland, Iceland, Scandinavia, the Adriatic, both shores of the Mediterranean, the Ægean, and the Canary Isles. Nor is its bathymetrical range in widely separated seas less worthy of remark. Wallich obtained it by means of his deep-sea soundings in the North Atlantic from 227 fathoms; and M'Andrew has recorded the depths at which he dredged living specimens on the coast of upper Norway as 15–150 fathoms, and Forbes in the Ægean as 15–140 fathoms.

The animal is shy. It uses its foot for crawling. The alimentary and branchial current enters in at the middle of the front margin; and the excretory current passes out below the ear on the posterior side. In a single valve now before me, one of the ears is twice the size of the other. The fry, $\frac{1}{40}$th of an inch long, are roundish-oval and distinctly ribbed.

L. subauriculata differs from *L. elliptica* in the shell being more arched or equally convex throughout, as well as much smaller and longer; the sculpture is coarser and the ribs fewer; the ears are smaller and droop a little; and the furrow is straight and placed in the middle. In the other species the shell is considerably broader and more expanded; the sculpture is finer and the ribs more numerous; the ears are larger and more erect; and the furrow runs obliquely, and is placed somewhat nearer to the posterior margin. The young of each species have corresponding characters. That of *L. elliptica* resembles *L. Sarsii* in shape, but differs *toto cœlo* in the sculpture and in having a conspicuous furrow.

The present species is the *L. sulcata* ("Leach") of Möller, *L. elongata* of Forbes, *L. subauricula* of Philippi, *L. sulculus* ("Leach") of Lovén, and *L. unicostata* of Leach's posthumous work on the Mollusca of Great Britain. I at one time thought it might also be the *Ostrea nivea* of Renier, which has been well described and figured by Brocchi. But although our shell is found in the Adriatic, and may therefore have been the species intended by Renier, I do not believe it occurs in the Subapennine tertiaries, so as to have fallen under Brocchi's observation; and neither of these authors has noticed the central groove or furrow, which is so characteristic of this species and *L. elliptica*. The *Ostrea subauriculata* of Turton's 'Conchological Dictionary' appears to have been the young of *L. Loscombii*, judging from his description and specimens.

B. Shell inequilateral, with an oblique outline.

4. L. LOSCOM'BII*, G. B. Sowerby.

L. Loscombii, Sow. Gen. Sh. (*Lima*) f. 4; F. & H. ii. p. 265, pl. liii. f. 1–3.

BODY bright orange-colour: *mantle* having its edges overlapping one another in front: *tentacles* of different lengths, ringed or verticillate as in some Nudibranchs, and arranged in several irregular rows; the front row is folded back over the outer edge of the shell: *foot* cylindrical and extensile, reddish-orange.

SHELL rhomboidal, twisted to one side, extremely convex, thin, rather glossy: *sculpture*, 50–60 very fine and sharp ribs or fluted striæ, which radiate from the beaks to the front and sides, but become faint or absent on the sides and near the hinge; the ribs are slightly flexuous and of unequal size, often alternately large and small, or two or three small ribs between some of the larger ones; there are also the same microscopical transverse lines as in *L. subauriculata* and other species, producing a similar serrature or corrugation of the ribs: *colour* snow-white: *margins* thin, oblique, bluntly rounded in front, ventral edge compressed and nearly straight, posterior edge rounded and sloping from the front and hinge-line to an obtuse angle about one-third down; the valves when closed gape a little on the upper part of the dorsal side: *beaks* extremely prominent and gibbous, projecting considerably beyond the hinge: *ears* triangular and very small, wrinkled in the line of growth: *cartilage* large and yellow: *ligament* thin, olive-green: *hinge-line* nearly straight, slightly curved outwards: *hinge-plate* narrow and sharp: *cartilage-area* broad; triangular space on each side of the beaks and within the ears small, but supported by a stout and somewhat incurved ledge: *inside* pearly, slightly granular, showing (although faintly) the impression of the outside ribs; front margin crenulated in young, but thickened in adult specimens: *muscular and pallial scars* distinct. L. 0·8. B. 0·55.

HABITAT: With the last species, and equally distributed, but usually not so common nor at such great depths. Capt. Beechey, however, dredged a living specimen off the Mull of Galloway in 145 fathoms. It occurs fossil in our Red and Coralline Crag. Abroad it ranges from the coast of East Finmark to the Ægean and the North African coast of the Mediterranean. Asbjörnsen gives the depth at which he found this species living in Christiania fiord as 5–20 fathoms.

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* Named in honour of Mr. C. W. Loscombe, who discovered this and other shells at Exmouth.

It seldom makes a "nest"; but I have one enclosed in this way, which I dredged on the north coast of Ireland. The case lies within a valve of *Mytilus modiolus*, and is composed of large fragments of shells, crabs, and barnacles. Sars obtained a similar specimen on the Norwegian coast. In all probability this habit depends on the nature of the sea-bottom. When the latter is soft mud the *Lima* can partly bury itself, and does not require to be otherwise protected from its voracious enemies. The haddock seems fond of it, the shells being often found in its stomach. The animal of *L. Loscombii* differs but little from that of *L. hians*. The pallial tentacles are somewhat thicker, and the foot is shorter and of a paler hue. Mr. Clark has seen it "repeatedly fix itself by fine byssal filaments, then detach itself and move with the greatest rapidity, crossing a dish of six inches diameter whilst one could be counted." When it crawls it uses its foot in the same way as *Modiolaria discors*, by extending and attaching the flexible point to the surface of the body it is traversing, and then drawing or warping itself up. This mode of locomotion is much slower than the usual one of swimming by a repetition of jerks. The fry are ribbed like the adult, but the lines of division between the striæ in the former are more remote.

It is the *Pecten fragilis* of Montagu but not of Chemnitz, the *L. bullata* of Turton but not the *Ostrea bullata* of Born, and the *L. reticulata* of Leach. The *L. Loscombea* of the last-named author, from Torbay, is in all probability the young of the present species; but his diagnosis is very obscure. Philippi considers Turton's *L. bullata* to be the *L. strigilata* of Scacchi but not the *Ostrea strigilata* of Brocchi. The latter is a common miocene fossil, and constitutes the type of Bronn's genus *Limea*.

5. L. HI'ANS*, Gmelin.

Ostrea hians, Gmelin, Linn. Syst. Nat. ed. xiii. p. 3332. *L. hians*, F. & H. ii. p. 268, pl. lii. f. 3–5, and (animal) pl. R, as *L. tenera*.

Body of different shades of colour between pale crimson and intense vermilion: *mantle* of an orange tint: *tentacles* very numerous, arranged in rows as in the last species: *foot* also similar.

Shell rhomboidal, considerably twisted to the ventral or anterior side, compressed, rather solid, of a dull aspect: *sculpture* nearly the same as that of *L. Loscombii*; but the ribs are stronger, and often become coarse and rough towards the margins: *colour* snow-white in the young, but dirty-brown in old specimens, which are frequently covered with fragments of byssal hairs, as well as with zoophytes and Foraminifera: *margins* thick, oblique, bluntly rounded in front, the ventral or anterior edge compressed and nearly straight, and the posterior edge truncate and sloping outwards at the same angle with the lower margin of that side as in the last species; the valves when closed gape very widely on both sides: *beaks* prominent and gibbous, not projecting much beyond the hinge: *ears* triangular, strong, and unequal, that on the anterior side being longer and wider than the other, which is sharp-pointed; both are coarsely wrinkled in the line of growth: *cartilage* and *ligament* large, horncolour: *hinge-line* formed like an arch, and increasing with age in the degree of curvature; its length is not equal to one-third of the entire breadth of the shell: *hinge-plate* thick, incurved in the middle to receive the cartilage: *cartilage-area* very large, causing the beaks to be widely separated when the valves are closed; triangular space on the anterior side indistinct, but that on the other side is deeply perforated in the centre and strengthened by a thick rib: *inside* pearly, closely granular, slightly impressed by the ribs; front margin scalloped or fluted in the young and very thick in the adult: *muscular and pallial scars* indistinct, especially the former. L. 1·6. B. 1.

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* Gaping.

Var. *tenera*. Shell smaller, narrower, and more depressed, with fewer ribs. *L. tenera*, Turton in Zool. Journ. ii. p. 362, t. xiii. f. 2. L. 1. B. 0·6.

HABITAT: Hard ground, in 12–40 fathoms, very common in the West of Scotland; Orkneys (Thomas); Aberdeen (Macgillivray); north-east coast of Ireland (Portlock, Hyndman, and Waller); Anglesea (M'Andrew and Forbes); Isle of Man (Forbes). A specimen from the last-mentioned locality, which I received from the late Professor Forbes, is intermediate between the typical form and the variety, as well as a specimen which Mr. W. W. Walpole sent me from Killiney Bay, near Dublin. As an upper tertiary fossil it has been noticed by the late Mr. W. Thompson and Mr. Grainger in a bed of blue clay at Belfast, and by Mr. Searles Wood in the Coralline Crag at Ramsholt. The variety is found on the southern coast of Cornwall and in the Channel Isles. It is not uncommon at Herm, under large stones, at low-water mark. The range of this variety southward is very extensive, having been recorded by numerous authors in different parts of the Mediterranean, Ægean, and North Atlantic seas, as far as the Canary Isles, Madeira, and the Azores, at depths of 0–50 fathoms. The typical or northern form inhabits the coasts of Norway and Sweden, in 4–30 fathoms. Malm found a specimen in the stomach of a cod-fish.

In Mr. Norman's interesting notices of the Clyde Mollusca (published in the 'Zoologist' for 1858) is the following:—"Nothing can be more lovely than the animal of *L. hians*, with its thousand delicate and beautifully ringed vermilion tentacula, each maintaining, as it were, a life independent of its neighbours, turning and twisting in every direction; the rich crimson foot and snow-white shell form an object which, to my eyes, is unsurpassed among the British Mollusca." He, however, adds:—"There is but one thing I have to say against this interesting molluscan; and that is, the animal has a peculiar, tenacious, and to me sickening odour: after having handled a number of them it is no easy matter to remove the smell from the hands with soap and water; and so strong a hold has the nauseous smell sometimes taken on my olfactory nerves that a whole night has scarcely sufficed to remove the impression." Perhaps the nasty smell may be accounted for by presuming that its apartment is never cleaned. When the *Lima* is first taken out of its case and put into a basin of sea-water, it is exceedingly active and restless, either violently darting round the sides of the vessel, or else gracefully careering about, with its long and thick fringe of filaments trailing behind it. In the course of a few minutes it seems to get tired, or reconciled to its prison; and it then lies on its back, the valves of the shell expanded, and reposes on its own soft luxurious cushion. The filaments at first curl and entwine round one another, a perfect nest of snakes, but afterwards they are withdrawn and become contracted; a circular inner row, like a coronet, surrounds the slowly-flapping gills; and the outer rows fold over on each side and form a sort of chevaux de frise. Dr. Landsborough supposed that these filaments were useful to the *Lima* in catching its prey. He observed that they are very easily broken off, and that they seem to live for many hours after being detached from the body, wriggling about like so many worms. The fry are of the same shape as the adult, and have slight but distinct ribs.

The habit of making a case or "nest" appears to be common everywhere; nor is it restricted to full-grown individuals. The Rev. R. N. Dennis informs me that he found at Herm certainly more than one hundred specimens of the variety thus enclosed, and that they were of all ages, but mostly young. He adds, "The nests were generally fixed under good-sized stones at low-water mark, and were broken in turning over the stones, when the Limas swam off in all directions. The largest number I found in one nest was, I think, seven; the largest and oldest-looking specimens were alone in the nest. I did not find a single specimen out of a nest. The Herm people call them 'Angels'-wings.'" The nest of *L. hians* measures from two to ten inches in length, according to the age and size of the occupier and the supply of materials. It somewhat resembles the case made by certain species of *Mytilus* (or *Modiola*), and has no analogy to the nest of birds and some fishes, being permanently inhabited by the *Lima* itself, or a colony of them. The fry are always left to provide for themselves, and do not require any parental care. This kind of "nest-hunting," therefore, is not a cruel, though an unusual sport. In a review of my first volume in 'Blackwood's Magazine,' the writer referred the pursuit of natural history to a Nimrod instinct. Perhaps, after all, he touched the right chord; for although we dignify hunting for shells, insects, and flowers by the imposing names of Conchology, Entomology, and Botany, such researches may partake as much of an innate love of sport as of the spirit of scientific inquiry. Dredging for Lima's nests is at any rate an amusement more suitable to grave naturalists, than looking after the eggs of our feathered songsters in woods and hedges, like schoolboys. A very intelligent naturalist, Mr. David Robertson of Glasgow, has favoured me with more information respecting the habits of *L. hians* in Scotch waters. He says, "In confinement they build freely; and so far as my observations go, they live longer in that state when they are supplied with the requisite materials, but failing such supply they frequently make nests of their own byssus. They also spin their byssal threads to assist them in ascending perpendicular or steep places; and, like the common mussel, the *Lima* often suspends itself by one or more fibres. Its attachment, however, is only slight; for the least irritation or alarm causes it to detach itself from the cable and bound off. It does not seem to be particular as to the kind of building-material which it uses. At Lochronsa in Arran I found their nests among the muddy roots of *Phyllophora rubens,* without the addition of any harder substance. At Rothesay the nests are made of small gravel; and at Cumbrae they soon fill the dredge, being formed of thick and matted clusters of nullipore. On this bank I never find them free; they are all encased, at all seasons of the year, young and old, from the size of a pea to the full-grown state, each having its own separate nest. A remarkable peculiarity of *Lima* consists in the tenacious grasp of its tentacles. Sometimes when my finger touched the animal, it was rapidly seized by the tentacles, as by those of an *Actinia,* and so firmly that I have thus dragged the *Lima* round the tank. It seldom let go its hold till the tentacles were torn away, or (as I believe) voluntarily thrown off by the animal. The tentacles so detached still adhere closely to the object they have grasped, their free ends twisting about as if in conscious life, and they are with difficulty taken off. Notwithstanding this property, I frequently find a small crab (*Porcellana longicornis*) in their nests, and not unfrequently an annelid (*Polynoë*), but almost invariably a greenish gelatinous annelid. This last kind I have noticed lying across the tentacles of a large *Lima*, which seemed to be quite at its ease and by no means incommoded by its neighbour. I have frequently kept *L. hians* in captivity for many months. I have now (January 1863) one which I took in May last, and it looks in good health. It commenced building in a day or two after it was put into the tank, and has ever since lived under its own roof, adding from time to time to the size of its oblong nest. This word ('nest') is, in a wide sense, not inappropriate as applied to the mode of architecture; but it must not lead to the idea of incubation, with which the structure seems in no way connected." I am indebted also to Mr. Robertson for another important observation, viz. that he has seen some individuals of *L. hians* shedding blood-red ova, and others spermatozoa at the same time, and that the flow of ova continued for about fifteen minutes, and to all appearance in two streams. This observation is of great value as regards the generative system of the Lamellibranch Mollusca; but we must not overlook the possibility that each individual may be of both sexes, although the period may vary for the development of its organs—*i. e.* that it may be male at one time and female at another, as is said to be the case with *Valvata* and *Ancylus* among the freshwater univalves. Or it may be analogous to what takes place in certain flowering plants. *Lobelia* is hermaphrodite, but usually sheds its pollen before the anther is prepared to receive it, so that self-fertilization is seldom effected, and the pollen of a neighbouring plant with the aid of winds or insects is almost always necessary to ensure propagation. It is to be hoped that some experienced physiologist will investigate the subject in all its bearings and set at rest this long-agitated question.

L. hians differs from *L. Loscombii* in its much larger size, being more depressed, and widely gaping at both sides instead of at the dorsal side only. It is the *L. fragilis* of Fleming, *L. vitrina* of Brown, *L. aperta* of Sowerby, *L. inflata* of Forbes, and *L. tenuis* of Leach. The original describer of the species was Schröter; but the name he gave it, being in his own language, is not admissible according to scientific rules. The *Ostrea tenera* of Chemnitz is a West Indian species of *Lima* and very different from the southern variety of *L. hians*.

I found a very small and imperfect single valve of *L. inflata* (Philippi) in trawl-refuse from the Plymouth coast. It is rather common in the Mediterranean. The shell is tumid and very strong for its size; the surface is coarsely decussated or reticulate by strong longitudinal ribs and transverse plates; the ears are remarkably small; and the hinge is furnished with a horizontal cartilage-pit as in *Pecten*. Lamarck's species of the same name is distinct from this; and according to him it inhabits "l'Océan américain."

** Mantle open in front, and forming at the posterior side (rarely at both sides) one or two tubes, which are mostly sessile.

Family IV. AVICU'LIDÆ, Swainson.

Body obliquely oval or oblong, compressed: *mantle* open, and free at its edges, which are fringed with cirri: *foot* small and cylindrical, furnished with a byssal groove.

SHELL shaped like the animal, inequilateral, scaly outside and nacreous within: *beaks* straight: *ligament* long and narrow, mostly internal and contained in a groove.

In this distinct family we have only two genera, each containing but a single species, which widely differs from the other. The intermediate links are wanting at our northern end of the chain. Elsewhere both genera and species abound in great variety; and, in remote periods of the earth's history, what are now called the British seas had also their full share. In studying the particular fauna of any district we are too apt to regard it in an isolated point of view, instead of associating it with the faunæ of other and distant regions. No member of this large family has been noticed as inhabiting the north-east coast or the northern part of the western coast of America, nor is any one enumerated in the lists of Arctic or Scandinavian Mollusca. The shell is composed of outer and inner layers. The outer layers are of a fibrous texture, and consist of extremely minute and closely-packed tubes or cells, which exhibit on their surface irregularly hexagonal prisms; they are separated from each other by a deposit of unusually thick animal matter; and, upon being steeped for some time in caustic potash, they easily become disintegrated and fall asunder, resembling in that state extremely short threads of spun glass. The inner layers are more compact and highly iridescent. The surface of the shell, both in *Avicula* and *Pinna*, appears under the microscope to be finely punctured, as in some species of *Lepton*. The anterior adductor muscle is small, showing a transition from the Monomyaria to the Dimyaria. Leach included this family in the first-mentioned division.

Genus I. AVI'CULA*, Klein. Pl. II. f. 3.

Body oval: *palps* or labial appendages large: *byssus* fibrous, coarse, and thin.

Shell square or elliptical, often winged or lobed, inequivalve; upper margin of the lower or left valve notched for the passage of the byssus: *beaks* placed nearer the anterior or narrower end, but never terminal: *hinge* furnished with teeth.

This genus is distinguished by the nacreous and iridescent lining of its shell, which in one species produces the oriental pearl, and in another is extensively used for inlaying and button-making.

1. Avicula hirun'do †, Linné.

Mytilus hirundo, Linn. Syst. Nat. p. 1159. *A. Tarentina*, F. & H. ii. p. 251, pl. xlii. f. 1–3, and (animal) pl. S. f. 4.

Body suboval, yellowish-white mottled with brown: *cirri* arranged in two rows, numerous and close-set, those in the front or outer row being longer than those in the inner row: *foot* white.

Shell elliptical, resembling that of a *Pinna*, with the addition of an unequal wing-like appendage on each side of the beak, very inequivalve in the young, but less so in the adult state, the upper or right valve being larger than the other, much compressed towards the margins, rather fragile, more or less glossy: *sculpture*, thin concentric plates or scales, which irregularly imbricate the surface and are sometimes spinous towards the anterior margin, besides superficial microscopic and close-set punctures: *colour* yellowish-brown, with purplish streaks which radiate from the beaks and are frequently interrupted or zigzag: *margins* very thin, rounded in front, more or less deeply incurved on the upper part of each side in consequence of the projection of the wings, straight or nearly so behind: *beaks* small, sharp, and slightly projecting over the hinge: *wings* triangular and bluntly pointed; they are of unequal size, those on the anterior side being small,

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[*] A little bird.

[†] Swallow.

and the opposite ones from six to ten times as long in full-grown specimens: *hinge-line* very long: *ligament* broad, separating the beaks, so as to form a rather wide area: *hinge-plate* thick, strong, and rounded: *teeth* consisting of a blunt tubercle in the upper valve, placed a little in front of and below the hinge, and a double tooth in the other valve, into which the tubercular tooth locks: *inside* highly and beautifully iridescent, marked with faint and irregular grooves which diverge from the beaks: *muscular scars* distinct, especially that of the posterior adductor. L. 3. B. 1·65.

HABITAT: Plymouth offing, procured by the trawlers in 20–25 fathoms, sometimes attached to species of *Gorgonia* and *Sertularia.* It is said also to have been found in Dublin and Bantry Bays; but this wants confirmation. Dr. Turton's specimen from the first of these localities looks too highly coloured to be British, and is more probably of foreign extraction. The collection of Irish shells made by the late Mr. T. W. Warren, and now in the museum of the Royal Dublin Society, contains a single valve of *A. hirundo,* which, according to Mr. Warren's Catalogue, was found by him at Portmarnock. This specimen has been kindly sent to me by Dr. Carte, the Superintendent of the museum, for my inspection. Together with it, and on the same tablet, is a young shell of a tropical species of *Avicula* (or *Meleagrina*), which is not unfrequently met with on the bottoms of vessels from South America. The present species, being in our seas an inhabitant of deep water and always attached, is not likely to be thrown up on a sandy shore. I have never heard of a *Pinna* being picked up as a similar waif of the ocean. Dr. Carte informs me that wrecks too frequently occur in Dublin Bay, which is completely exposed to eastern gales and situate in very nearly the same parallel of latitude as Liverpool, to which port the unfortunate merchant vessels are bound. Miss Hutchings, who (according to the late Mr. James Sowerby) discovered this species in Bantry Bay, was infinitely better acquainted with seaweeds than with shells. I have some of the latter which Mr. Dillwyn received from that lady, as collected by her in Bantry Bay, and which are unquestionably Mediterranean and not Irish. One of them is *Arca barbata.* Such mistakes often happen in spite of the best intentions. I do not say, however, that *A. hirundo* has never been found in Ireland, or that it may not hereafter be rediscovered there. It occurs, but very rarely, in the Coralline Crag. Its exotic distribution is wide, and comprises both sides of the Mediterranean, as well as the Adriatic and Ægean Seas, the Canary Isles, Madeira, and the Azores. Mr. M'Andrew has taken it on the shore near Gibraltar, and in the Canaries as deep as 50 fathoms.

The shell has a very remarkable shape, not unlike that of a swallow on the wing. Two of Lamarck's species of *Avicula* (*Atlantica* and *Tarentina*) appear to be the same as the present species, representing the younger and mature states of growth. The former he describes as having the valves unequal in size, and the latter as being equal-valved. If one of these specific names had to be selected, the description of "*Atlantica*" would therefore be more appropriate than that of "*Tarentina*" to our shell. Linné's diagnosis of *Mytilus hirundo* is equally applicable; and it would be a pity to reject that time-honoured name in favour of any other given by subsequent writers. Turton was mistaken when he described, in his 'Conchological Dictionary,' a second species (*A. morio*) as British, on the authority of Dr. Leach. The latter distinctly stated that species to be exotic; but in his account of the genus *Avicula* (contained in the 'Zoological Miscellany' for 1814) he mentioned that "one indigenous species" had been discovered at Plymouth by Mr. Prideaux. In his 'Synopsis of the British Mollusca' he gave the last-mentioned species the name of *Britannica*.

Perna alata (*Crenatula Travisii* of Turton) is a native of tropical seas, but was accidentally imported into this country on the bottom of a ship which came into Scarborough. Many foreign mollusca have been introduced in the same way. They continue to live for some time after entering our colder seas, but they never become acclimatized.

Genus II. PINNA *, Lister.

Frontispiece and Pl. III. f. 1.

Body oblong and attenuated: *palps* small: *byssus* silky and copious.

Shell forming an elongated triangle, equivalve, widely gaping in front, and slightly on the anterior side for the passage of the byssus: *margins* entire: *beaks* terminal and pointed: *hinge* toothless.

We now approach the Mussels, to which the shells composing the present genus bear a considerable resemblance. The principal distinction is that the former have the valves entirely closed, while in the latter they gape widely at the larger end, as well as that the beaks in *Mytilus* and its allies are not placed at one end of the shell as in *Pinna*. According to Da Costa the shell of *Pinna* is called in France "jambon" and "jambonneau"; and it looks exceedingly like a small ham. In another point of view it is a wingless *Avicula*. Pliny's account of the little pea-crab, which is so often found in this mollusk (as well as in *Mytilus modiolus* and *Cyprina*

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* From the *πίννα* of Aristotle, who first mentioned this mollusk.

Islandica), and of its playing the part of jackal to the lion, has been so often repeated, that I will not inflict it again on my readers. Cicero was fully persuaded of the truth of this pretty fable, and he used it as an illustration in his treatise 'De Naturâ Deorum.' Swan, in his 'Speculum Mundi,' moralized upon it as follows:— "And thus day by day they get their living, like a combined knot of cheaters, who have no other trade than the cunning deceit of quaint cousenage; hooking in the simple sort with such subtill tricks, that be their purses stuft with either more or lesse, they know a way to sound the bottome, and send them lighter home: lighter in purse, though heavier in heart." But Pierius, in his 'Hieroglyphica,' draws a different conclusion; for, after quoting Theophrastus ("vita fortasse conchis servari non potest, nisi ope cancri"), he commends the example of the Pinna and its companion to any one who cannot do without the aid and counsel of another. Poli gave the name *Chimæra* to the animal of this genus, and fully treated its anatomical details, the illustration of which occupies no less than four plates of his magnificent work. But he denied it a foot ("pes nullus"), and stated that the byssus issued from the base of an organ which he called "ligula." Another Neapolitan writer (Giannettasi), although not also a naturalist, celebrated the *Pinna* at great length in the eighth book of his 'Halieuticon.'

1. PINNA RU'DIS[*], Linné.

P. rudis, Linn. Syst. Nat. p. 1159. *P. pectinata*, F. & H. ii. p. 255, pl. xliii. f. 1, 2, and pl. liii. f. 8.

BODY large, reddish-brown or yellowish: *cirri* arranged in two rows on the posterior margin of the mantle, and in one only on the anterior margin: *foot* conically subcylindrical, and having a byssal groove at the posterior bend.

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[*] Rough.

SHELL tapering to a point at one end and expanding at the other to an obtusely rounded or slightly truncate edge, convex, with a gradual slope towards the sides, rather thin for its size, more or less glossy: *sculpture*, 8–12 long delicate ribs on the dorsal portion, radiating from the beaks, and sometimes numerous shorter ribs on the anterior portion of the shell, extending to that margin; these ribs often rise at irregular intervals into vaulted prickles in consequence of an exfoliation of the outer layers; the whole surface is also covered with the microscopical punctures peculiar to this family: *colour* yellowish-brown: *margins* very thin in front and on the anterior side, but thickened on the dorsal side, which is straight or occasionally a little incurved, and sloping gradually on the other side (with the exception of a slight indentation for the byssus) to a blunt angle, where it meets the front margin: *beaks* strong and exceedingly prominent, much worn and broken in adult specimens, and furnished inside with a series of concentric plates, in consequence of the successive shiftings and advance of the anterior adductor muscle: *hinge-line* extremely produced, occupying two-thirds of the entire length: *ligament* horny, narrow, very strong and elastic: *hinge-plate* folded over the ligament, so as to contain it in a kind of sheath or groove, closed or firmly soldered for a short distance beyond the posterior termination of the ligament: *inside* highly nacreous and iridescent, of a darker colour on the upper half than below: *muscular scars* very distinct. L. 10·5. B. 6.

HABITAT: Sparingly and locally distributed on all the British coasts, but gregarious, from low-water mark to 80 fathoms, in muddy or sandy gravel. Fragments have been found in the Coralline Crag. Its foreign range extends south to both sides of the Mediterranean, and also to the Canary Isles. It has not been noticed as occurring anywhere north of Shetland.

The "fan-mussel" is by far our largest shell, measuring sometimes fifteen inches in length and eight in breadth. It varies greatly in proportions and sculpture. Specimens in some situations have a tendency to expand, and become distorted in consequence of their confined position. The fry have spoon-shaped and somewhat incurved beaks, and in that state no ribs or striæ are formed. Dr. Walker says that the Gaelic name of the shell is "feaskand." Very little appears to be known in this country as to the animal. Pennant gravely called it "a slug." Montagu, and recently Mr. Couch, imagined that it could close the larger end for the same purpose as that stated by the ancients, viz. to catch little fish! Many writers have supposed that it can weigh anchor when it pleases, and remove to a better feeding-ground; but it would not seem to be fond (if capable) of changing its place of abode, unless when very young, and before it has settled down for life. The worn state of the beaks and the not unfrequently distorted contour of the shell show that it lies partly buried in the ground and continues for a long time in the same place. If it is forcibly torn or driven from its anchorage, it can undoubtedly spin a new byssus and reattach itself. The fibre of this curious appendage or "beard" is tubular like hair. When dried it is stiff and wiry; but if used fresh it is sufficiently flexible to be woven into gloves and stockings. Tarento is a noted place of manufacture for such articles; and at our last International Exhibition a Cornish muff made of this material might have been seen by those who were disposed to venture into an obscure gallery in search of the few objects of natural history for which any space was allotted. According to Vérany the byssus is a successful remedy for the ear-ache; but he does not say in what manner it is applied. However, this production is evidently of more use to the Pinna than it can be to man. Most other bivalves are provided with the same apparatus. Réaumur justly remarked that the sea has her spinners in the mussels, as the earth has in her caterpillars and spiders. The animal is said to be good to eat; but it requires five or six hours' stewing, and then is not so tender as a scallop. The fibrous particles which compose the shell are crystalline, and very beautiful objects for the microscope. Mr. Spence Bate informs me that the trawlers at Plymouth call these shells "caperlongers," and that they avoid the Pinna-ground for fear of their nets being torn. The shells are described as standing upright on their narrow end, and as bearing some resemblance to trees in a thick forest. The word "caperlonger" appears to be a corruption of *Cappa lunga*, by which name the Pinna is known in the Mediterranean. So many of our men-of-war have been at Naples, that the familiarity of Plymouth seamen with such Italian words is easily explained.

Owing to the variableness of its sculpture and solidity, this species has received many names from British conchologists, viz. *borealis, pectinata, fragilis, muricata, ingens, lævis, papyracea, rotundata,* and *elegans.* It may, however, be observed that the *P. muricata* of Linné has never been found in this country, and that "India" is stated to be the habitat of his *P. pectinata.*

Family V. MYTI'LIDÆ, Fleming.

Body thick and rather convex: *mantle* more or less open in front, and usually folded on the posterior side into a wide excurrent tube or slit: *foot* shaped like a strap or worm, and having a byssal groove.

Shell obliquely oblong, oval, or rhomboidal, equivalve, inequilateral, and covered with an epidermis: *beaks* incurved: *ligament* long and narrow, mostly internal, and contained in a groove.

The Mussel family differs from the last in the mantle not being open throughout, but having its edges united behind, so as to form a separate opening for excretal purposes, as well as in the shell increasing excentrically, and not being scaly but provided with an epidermis, and in its beaks being incurved instead of straight. Although all mussels spin a byssus, and are commonly attached by this mode, some of them have a considerable power of locomotion, dropping their anchors and casting new ones at will. The composition of their shells, according to Mr. Sorby, is calcite, and ought therefore to be durable; but I have generally found them to be much decomposed in the newer tertiaries. The anterior adductor muscle is very small and placed immediately within the beaks of the shell.

Genus I. MYTILUS *, Linné. Pl. III. f. 2.

Body subconical: *mantle* widely open in front: *foot* strap-shaped.

Shell oblong or oval: *hinge* often furnished with small tubercular teeth.

The Linnean characters of *Mytilus* were very various, and comprised freshwater as well as marine shells. Bruguière was the first to restrict and define the genus as it is now recognized. Lamarck separated from it certain species to form his genus *Modiola*; but I believe the opinion that they ought to be reunited is held by most authors who have bestowed much attention on the classification of the Mollusca. The only indications which Lamarck has given to distinguish *Modiola* from *Mytilus* are that the beaks of the shell in the first of these genera are not quite terminal, and that the animal is seldom fixed by a byssus. But on neither ground can the genera be separated. Any one who has examined the beaks in a common mussel must see that they are not placed at the end. Their comparative distance from this point is in every case, whether of *Mytilus* or *Modiola*, a mere question of degree. The so-called *Modiolæ* are invariably fixed by a byssus; and the typical species (*M. modiolus*) are attached to the beds on which they congregate precisely in the same way as *Mytilus edulis*. The only appreciable difference in a generic point of view that I can detect between *M. modiolus* and *M. edulis* is that in the latter the front edges of the mantle are fringed, while in the former they are plain, and also that the small tubercles of the hinge in *M. edulis* only occur in the very young of *M. modiolus*, and not in a subsequent stage of growth. In *M. phaseolinus*, however (which has always been regarded as a *Modiola*), these tubercles are represented by minute but distinct crenulations. The shells of all the British species of *Mytilus* are smooth. The byssus proceeds from a gristly shaft, which appears to support the bundle of filaments like the handle of a broom. *Mytilus* is a very ancient name, and was also spelt by classic authors *Mytulus, Mitulus,* and *Mutulus*. The animal is the *Callitriche* of Poli.

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* From μυτίλος, a name given by the Greeks to this sort of shell-fish.

1. MYTILUS EDU'LIS*, Linné.

M. edulis, Linn. Syst. Nat. p. 1157; F. & H. ii. p. 170, pl. xlviii. f. 1–4, and (animal) pl. Q. f. 5.

BODY varying in colour from white to orange-yellow, with a tint of reddish-brown or purple: *mantle* having two margins; outer one plain; the inner one pinnated, or fringed on the ventral and anterior sides with 15–25 tentacular cirri, and serrated on the branchial portion: *foot* dark brown, occasionally streaked with white down the middle.

SHELL irregularly triangular, expanding from the smaller end to an obtusely rounded edge, gibbous with a gradual slope towards the front and sides, rather thin and glossy: *sculpture*, concentric and indistinct lines of increase: *colour* bluish or purple: *epidermis* dark brown or olive, occasionally yellowish or having a reddish tint, rarely black, microscopically striated lengthwise and shagreened, sometimes puckered in particular spots: *margins* rather thick, nearly straight on the ventral side and arched behind, obliquely rounded in front: *beaks* blunt, more or less divergent, placed a little below the termination or point of the shell, which is formed by the dorsal edge of the first-formed part or nucleus; beneath the beaks is an imperfect lunule or heart-shaped impression, which often appears to be repeated, showing the marks of successive growth: *hinge-line* nearly straight, occupying almost the upper half of the dorsal margin: *ligament* very thick and strong: *hinge-plate* partly folded over the ligament, the middle of which is consequently exposed: *hinge* furnished with 3–10 small tubercular teeth in each valve: *inside* chalky-white, slightly nacreous at the edges, and pitted (as in *Unio margaritifer*) by the impressions of the mantle: *muscular scars* very distinct. L. 2·3. B. 1·2.

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* Eatable.

Var. 1. *ungulata*. Shell larger, more pointed at the narrower end, and sometimes angular at the other, with the ventral margin incurved: *beaks* more widely separated than usual. *M. ungulatus*, Linn. Syst. Nat. p. 1157.

Var. 2. *incurvata*. Shell stunted and bent, often marked by longitudinal rays of purple. *M. incurvatus*, Pennant, Brit. Zool. iv. p. 111, pl. 64. f. 74.

Var. 3. *Galloprovincialis*. Shell broader and flatter, with the ventral margin somewhat prominent and the posterior angle more acute than in the typical form: *beaks* incurved. *M. Galloprovincialis*, Lamarck, An. sans Vert. vi. p. 126.

Var. 4. *pellucida*. Shell thin, narrower, less gibbous, and beautifully streaked by longitudinal rays of dark brown or purple, which are irregularly disposed. *M. pellucidus*, Penn. op. c. p. 112, pl. 63. f. 75.

HABITAT: Abundant everywhere and gregarious, from high-water mark to the depth of a few fathoms, on a rocky, stony, or muddy bottom. Var. 1. Cornwall and Channel Isles, at low spring tides. This variety is the

M. hesperianus of Lamarck. It attains a considerable size, and I have a specimen which measures nearly five inches in length. I may here observe that Mr. Barlee's shell, recorded in the 'British Mollusca' as belonging to this species and eight inches and a half long, is *M. modiolus*. Var. 2. On all rocky coasts, filling crevices and crowded together, so as to prevent the free development of each individual. Var. 3. Solitary and therefore larger and more expanding. Var. 4. On floating buoys and sunken wrecks, often at a considerable distance from land. Young shells of the ordinary kind often resemble the last variety in substance and markings. The common mussel is found in all our upper tertiaries; but only the sublittoral variety (*M. hesperianus*) occurs in the Coralline Crag. It is distributed throughout the northern hemisphere from the polar circle to the Ægean Sea and the coast of Morocco, and it seems to thrive equally on both sides of the Atlantic. The *M. trossulus* of Gould, from Vancouver's Island, probably differs in no other respect than being called a "representative" species.

Although *M. edulis* here inhabits the coast-line only, Dr. Walker is said to have dredged it in Baffin's Bay at a depth of 140 fathoms. I once obtained a fresh single valve in between 70 and 80 fathoms about forty miles off the Shetlands; but it had perhaps been voided by a coal-fish (*Gadus carbonarius*), which frequents the shore in the spawning-season. The mussel is occasionally found with the common periwinkle (*Littorina litorea*), living on the shore in a stream of perfectly fresh water during the recess of the tide. The common cockle (*Cardium edule*) and *Mya arenaria* have the same habit; and I have even seen the two latter species associated with fresh-water mollusca. All of these can exist for many days out of water. Young shells of *M. edulis* are coated with short bristly hairs, and resemble in shape those of *M. modiolus.* They grow very rapidly. According to Mr. Clark, if the fishermen's lobster-pots are left for a week or two in the autumn, they will be covered with mussels more than half an inch long. M. Bouchard-Chantereaux has often watched this mollusk in the act of spinning its byssus. He says that when put into a vessel of sea-water, it first creeps along the bottom by means of its foot and tries to ascend the side. After a while it deposits from the end of its foot a speck of white transparent matter, which spreads out and immediately hardens like china-cement. This plate serves as a base of attachment; and from the centre of it the mussel secretes very slowly and by a backward movement a gluey thread, repeating this process ten or twelve times in a circular direction. The threads become horncolour in from twenty-four to thirty hours after being spun. It is said to have the power of contracting its byssus at will; but I should be inclined to doubt it. The mussel is on the whole a respectable and stay-at-home character, seldom leaving its place of abode unless it has been dislodged by an unusually boisterous wave or by the equally rude and violent hands of man. Charles Lamb speaks of its "dignified leisure," while traversing the circuit of two inches square, within which it swings by the aid of its elastic cables. When confined in a prison called an aquarium, it appears to be more restless than in its native haunts, perhaps trying to escape from the unaccustomed quarters in which it finds itself, and in vain awaiting the welcome refluence of the tide. It may then be observed making occasional journeys from one part to another, and leaving at every stage or halting-place a bundle of filaments attached to the glass. It is also curious to notice a young mussel in a rock-pool, slowly and painfully warping itself along by its extensile foot, the point of which is attached like the sucker of a leech. The foot is stretched far beyond the beak of the shell on the anterior side. For anatomical details of the animal I would refer my readers to the admirable treatise of Professor Lovén on the development of the Lamellibranchiate Acephala. The fry has two very distinct eyes, which soon disappear and are quite absent in the adult. The cilia which clothe the gills are extremely beautiful and interesting objects of microscopical examination. If a small portion of one of the gills is cut off and put into sea-water, it will swim about for a considerable time by means of these cilia, appearing like an independent animal. The shell sometimes grows to a colossal size. In the 'Transactions' of the Imperial University of Moscow for 1863 is a notice by Dr. Nordmann of a gigantic form of the present species found by Holmberg on Edgecombe Isle in Russian North America. One specimen, which is figured of the natural size, measures upwards of 9 inches in length and 4¼ in breadth, and is stated to weigh 1 lb. 5 dr. 16 gr. The stunted variety (*incurvata*) forms on some parts of our rocky coast a mass so closely packed that the point of a knife could scarcely be thrust between them. This was probably the "amazing bed of small mussels" mentioned by Pennant in his 'Introduction to Arctic Zoology,' and as to which he remarks, "I think they were brought there by sea-fowl to eat at leisure"! Fabricius says it is viviparous, and that in the spring he has found the fry lodged within the hinge of their parent's shell; but it seems more probable that this was only a place of temporary shelter for them. In the Shetland Isles the edible mussel is called "Crockling," being evidently a corruption of the Icelandic word "Kræklingur," having the same signification. The hinge-teeth are usually three or four only. The shell is often distorted.

The mussel has been from time immemorial a favourite article of food in this and other maritime countries. Pennant, after a preface of "Ne fraudentur gloriâ sua littora," especially praises those from Lancashire. Large quantities are regularly brought to Billingsgate from the Dutch coast. A small kind, called in Brittany "Cayeu," is chiefly in request there, being esteemed more delicate and digestible. "Potage aux moules" is by no means to be despised at the table d'hôte of the Hotel de l'Epée at Quimper. Herr Adolphe Meyer informs me that boughs of elm and other trees are laid down in the Bay of Kiel, and taken up at the end of three, four, or five years, between December and March, being then covered with fine mussels. These laden boughs are sold by weight, and the shell-harvest is sent into the interior of Germany, where it is in great request. He adds that the mussel is not reckoned wholesome in summer. Many cases of serious illness, and even of death, have resulted from its occasionally deleterious qualities. "The faculty" seem to be completely at fault as to the nature of this poison. By some it is attributed to the mussels living among putrescent matters, as in docks and near the outlet of public sewers; by others to their feeding on the spawn of starfish, which are well known to be poisonous; by others to their being too freely eaten and causing a surfeit, or to a morbid state of the system in the persons eating them; by a few to their imbibing into their tissues a solution of copper; and Delle Chiaje showed that in many instances it was owing to these mollusks being at the time in spawn and therefore out of season. A strange notion once prevailed that the poor little pea-crab was the author of all this mischief; and it was consequently stigmatized as "malignant."

Nor is it only as an article of food that these shell-fish are of use to man. In Lister's time live mussels were gathered and spread over the fields in Lancashire for manure. Fabricius mentions that the fish eaten raw is an excellent remedy for sore eyes, and that the shell serves as a razor to shave with. I should not like to try the latter experiment on a frosty morning, or when late for breakfast. Mohr says that mussels are not eaten in Iceland, but that lime is made from their calcined shells, and is much more binding and becomes harder than mortar made from limestone. They are also used extensively for bait in our long-line fisheries; and Asbjörnsen has given, in his 'Christianiafjordens Litoralfauna,' some interesting particulars of the mussel-fishings on that part of the Norwegian coast, and especially with regard to an epidemic that in the summer of 1852 destroyed millions of them and caused great distress to the poor fishermen. In Drummond's 'Letters to a Young Naturalist' it is stated that mussels are used at Bideford to fix by means of their byssus the stones of a bridge, which is difficult to keep in repair owing to the rapidity of the tide. The interstices of the bridge are filled with them, and it is said that only their strong threads support the fabric and prevent its being carried away. It is one of the instances of contrivance enumerated by Paley in illustration of his chapter on compensation, and to show that the works of the Deity are known by expedients. He says, "A *muscle*, which might seem, by its helplessness, to lie at the mercy of every wave that went over it, has the singular power of spinning strong tendinous threads, by which she moors her shell to rocks and timbers." Pearls too are produced by them in considerable quantities, although of an irregular shape and indifferent lustre. Formerly they were applied medicinally as an absorbent. Great numbers are still collected at the mouth of the River Conway in North Wales, the fish being boiled and trodden out by the naked feet of women. What is done with these "seed-pearls" is a mystery. I have been told that the Jews purchase them for the Birmingham market; and a correspondent in Loudon's Magazine of Natural History for 1830 mentions a surmise that they are exported to India to be dissolved in the sherbet of the nabobs!

This species in a recent and fossil state has received twenty-eight different names. Its variability is coextensive with its diffusion.

2. M. MODI'OLUS *, Linné.

M. modiolus, Linn. Syst. Nat. p. 1158. *Modiola modiolus*, F. & H. ii. p. 182, pl. xliv. f. 1, 2.

BODY dark orange, speckled with white and often tinted with brown: *mantle* having both margins plain throughout, but finely ciliated: *foot* red on the upper part, and whitish at the base, where it is very thick and strongly wrinkled.

SHELL oblong, bluntly rounded, nearly square at the smaller end and expanding outwards to a semicircular edge in front, convex, and gibbous towards the beaks, solid and glossy: *sculpture*, fine concentric lines of increase: *colour* purplish-yellow: *epidermis* thick, dark brown or dusky, almost black in the adult, minutely striate lengthwise, foliated in the young and produced into long thorn-like filaments, which are plain at their edges and arranged in concentric rows on the posterior side and in front: *margins* thick, straight or but slightly incurved on the ventral side, obtusely rounded behind and semicircular in front: *beaks* blunt, divergent and incurved, placed a little below the point of the shell and at a short distance from the anterior margin: *hinge-line* gently curved, occupying nearly the upper half of the dorsal margin: *ligament* extremely strong, partly exposed: *hinge-plate* solid: *hinge* toothless, reflected: *inside* nacreous and often studded with incipient pearls: *muscular* and *pallial scars* very distinct. L. 5. B. 2·5.

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* The box of a pump.

Var. 1. *ovata*. Shell smaller, narrower at the smaller end and broader at the other. L. 3. B. 2.

Var. 2. *umbilicata*. Shell narrower; anterior margin inflected and forming a deep sinuosity. *M. umbilicatus*, Penn. Brit. Zool. iv. p. 112, pl. 65. f. 76.

Habitat: Coasts of England, Wales, Ireland, and Scotland, from low-water mark to 80 fathoms, and at a distance of more than forty miles from land, in muddy gravel. It is not common in the first two localities, but abundant and gregarious in the north and west of Scotland and Shetland, at depths varying from 2 to 20 fathoms. Var. 1. Lismore (Bedford); Portmarnock and county Antrim (J. G. J.). Var. 2. Cork Harbour (Humphreys). The species occurs in all our upper tertiaries, and especially in the glacial beds. It ranges from Behring's Straits (Wosness), New England (Stimpson), and Iceland (Steenstrup) to the Danish coasts of the Baltic; but I am not aware that it has been noticed further south. In Calabria, however, it is fossil, and was described by Philippi under the name of *Modiola grandis*. This is another proof of arctic conditions having formerly pervaded the South of Europe.

Pennant must have considered this to be a fish, when he says it "often seizes the bait of the ground-lines." It is now and then caught by the beard and hooked up in this way. In some parts of Shetland and the north of Ireland it is eaten by the poorer class; and everywhere it is reckoned an excellent bait for fish. The epidermis of immature shells is yellowish-brown, and has an agglutinating property, being frequently coated with gravel and bits of shell. In this state the dorsal angle is more acute. Rude nests or cases are occasionally made by the young for their protection. The spots where pearls are in course of formation exactly correspond with the holes drilled by species of the curious sponge called *Cliona* from the outside of the shell. A transverse section admirably displays the mode of growth and secretion of colour. The outside layers are purple; while the inner layers, which are three times as thick and numerous as the others in full-grown shells, are white. The "horse-mussel," as it is called, attains an enormous size under favourable circumstances. One of my specimens, which Professor King got on the Northumberland coast, is about nine inches and a quarter long and of a proportionate breadth and capacity. It would have made a dainty drinking-cup for Mimer, or a pretty toy for one of the other giants, of whom Öhlensläger sung in his 'Nordische Guder,'

> "And all round the cavern might plainly be seen,
> Where Giants had once been at play;
> For the ground was with heaps of huge muscle-shells strewn,
> And strange fish were mark'd in the clay."

This is the *Modiola papuana* of Lamarck, but not the *Mytilus Papuanus* of D'Argenville, which is a tropical species. The former referred to his *Modiola tulipa* the *Mytilus modiolus* of Linné. Mr. Hanley also states that, from an examination of the typical specimens, the *M. modiolus* of Linné is not our species but the *Modiola tulipa* of Lamarck. This shows the discrepancy between the Linnean collection of shells and the 'Systema Naturæ,' and how little reliance can now be placed on the former for identifying some of the species. Linné's description agrees *ad amussim* with the common shell which is usually regarded as *M. modiolus,* the animal of which he says is eaten in Norway. According to Lamarck, his *Modiola tulipa* inhabits "les mers d'Amérique." Our shell is the *Modiola vulgaris* of Fleming. The young is the *Mytilus curtus* of Pennant and the *Modiola barbata* of Macgillivray.

3. M. BARBA'TUS *, Linné.

M. barbatus, Linn. Syst. Nat. p. 1156. *Modiola barbata*, F. & H. ii. p. 190, pl. xliv. f. 4.

BODY reddish-brown: *mantle* not folded: *gills* narrow, coarsely pectinated; lower pair more than twice the depth of the upper ones.

SHELL irregularly triangular, pointed at the smaller end and expanding obliquely outward to a broad and obtusely rounded edge in front, compressed, but gibbous towards the beaks, solid, somewhat glossy on the upper part, but elsewhere of a dull hue owing to the close investment of the bearded epidermis: *sculpture,* numerous concentric membranaceous ridges: *colour* yellowish-red, or scarlet: *epidermis* thick, yellowish-brown, minutely but deeply striated lengthwise, thickly foliated, and rising on the posterior side and in front into a fringe of thorn-like projections, which are distinctly serrated or barbed on the side facing the ventral portion; the epidermis is reflected over the front edge and forms a glistening band inside it: *margins* thick, straight or incurved on the ventral side, angulated behind, and obtusely rounded in front: *byssal sinus* large and rather long: *beaks* small, close together, incurved, placed (as in *M. edulis*) very near the point of the shell: *hinge-line* straight, occupying about one-half of the dorsal margin: *ligament* narrow, much sunk: *hinge-plate* thick, deeply grooved for the reception of the ligament: *hinge* toothless, reflected: *inside* highly nacreous and iridescent, sometimes beautifully stained with purple on the posterior side and occasionally studded with sessile pearls: *muscular scars* indistinct: *pallial scar* well defined. L. 1·8. B. 1.

Var. *oblonga.* Shell more elongated and tumid; ventral side incurved, and dorsal side arched instead of being angulated.

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* Bearded.

Monstr. Upper valve nearly flat and much smaller than the other.

HABITAT: Not uncommon on the southern and western coasts of England, Wales, and Ireland, and found by Mr. Bean at Scarborough, on rocky and stony ground, from low-water mark to 18 fathoms. Var. Portsmouth (J. G. J.). Monstr. South Devon (Mus. Loscombe). This species is a Red Crag fossil. It has not been recorded from any place north of England; but its southern range extends to the Ægean and Algeria.

According to Mr. Clark the gills "entirely coast the body, being brought close to the posterior extremity to receive the water. This structure of the branchiæ is the substitute for the absence of tubes or any sort of siphonal fold of the mantle." The shaggy beard of the shell is very peculiar. Montagu says that it is partly owing to the epidermis being broken and divided into fibres; and he also observes that, while in a soft and glutinous state, it arrests such extraneous matter as comes in contact. Gould suspected that the epidermis was a parasitic vegetable; but he evidently had not then had an opportunity of seeing it. The byssus resembles a bundle of fine tow. *M. barbatus* differs from the young of *M. modiolus* in the shell being narrower at the anterior and much broader in proportion at the posterior, side, as well as in the angularity of the dorsal margin, straight hinge-line, strong laminar ridges, reddish colour, and the epidermis being serrated or barbed on one side instead of being plain as in that species.

This species does not appear to inhabit the north of Europe, unless it is the shell noticed by Müller in his 'Zoologia Danica' as smaller than *M. modiolus*, with a black epidermis and quite of a purple colour inside towards the broader end, and having the valves less raised near the hinge and compressed in front. The *M. barbatus* of his 'Prodromus' is probably the young of *M. modiolus*. Linné also described the present species in his 'Fauna Suecica,' but not with sufficient precision. It is the *Modiola Gibbsii* of Leach's 'Zoological Miscellany,' and *Mytilus Gibbsianus* of his work on British Mollusca edited by Dr. Gray.

4. M. ADRIA'TICUS *, Lamarck.

Modiola adriatica, Lam. An. s. Vert. vi. p. 112. *Modiola tulipa*, F. & H. ii. p. 187, pl. xlv. f. 7; pl. xlviii. f. 6; and (animal) pl. Q. f. 6.

BODY pale red with a yellowish tint: *mantle* forming two incomplete very wide and short tubes, which are of equal length and scarcely separated from each other; the mouth of each tube is fringed with about twenty close-set short cirri: *gills* pale brown: *foot* long, flattish and slender, divided lengthwise by a flake-white line, and having a byssal groove which increases in depth from point to heel: *byssus* strong, yellowish.

SHELL oval, inclining to rhomboidal, bluntly pointed or rounded at the smaller end, and expanding outwards as in the last species, convex, extremely gibbous towards the beaks, thin and of a delicate texture, glossy: *sculpture*, fine but irregular lines of growth: *colour* yellowish, with usually rose-red rays on the posterior half, occasionally purple; these rays or streaks resemble those of a tulip, and are very beautiful; they are variously arranged, and sometimes broken or interrupted: *epidermis* thin, yellowish, and like a coat of varnish, sometimes a little exfoliated on the dorsal side and in front, and forming slight hairs, marked lengthwise by minute lines or scratches: *margins* thin, straight on the ventral side, angulated behind and rising into a shoulder or sharp keel towards which the posterior sides are compressed, semicircular in front: *byssal sinus* represented by a narrow slit: *beaks* small, close together, inflected, placed at comparatively a considerable distance from the anterior margin: *hinge-line* gently curved, occupying about one-half of the dorsal margin: *ligament* narrow, much sunk: *hinge-plate* thin, with a deep ligamental groove beneath it, which is supported by a strong rib: *hinge* toothless, reflected: *inside* nacreous and iridescent, sometimes red or tinged by the outside rays: *scars* rather distinct. L. 1·2. B. 0·7.

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* Inhabiting the Adriatic.

Var. *ovalis.* Shell much larger and narrower, almost cylindrical, more solid; ventral margin slightly incurved: *colour* yellow, with dark-purple rays: *epidermis* horncolour or brownish-yellow. L. 2. B. 0·85. *Modiola ovalis,* Sowerby, Ill. Ind. Brit. Shells, pl. 7. f. 7.

Habitat: By no means rare, although not common, in the South of England and the Channel Isles, as well as on the coasts of North and South Wales and Ireland, in 7–40 fathoms, muddy gravel or sand. I know of only three localities for it in Scotland, viz. Firth of Forth (Forbes); off Foula, Zetland, in 45 fathoms (M'Andrew); and Loch Carron, Ross-shire, in 28 fathoms (J. G. J.). A specimen dredged by me in the last-mentioned place is of a uniform pale yellow and much larger than those from the south, as might have been expected. The variety is rather plentiful in one part of Falmouth harbour; and I have also taken it off Guernsey, but of small size. The same variety occurred in excavating a channel in Belfast harbour, and may be considered a newer pliocene fossil. Lilljeborg has found this species in Finmark, Malm on the coast of Sweden in 10–15 fathoms (in one case attached by the byssus to *Corallina officinalis*), and Hællebæk on the Baltic coast of Zealand. Its distribution southward extends to the Ægean and the Gulf of Tunis, at depths varying from 2 to 50 fathoms.

This prettily painted mussel often makes in its young state a case like that of *M. modiolus.* When the animal is dead, the shell floats on the surface of water, by reason of its lightness and being perhaps buoyed up by gas generated in the process of decay. The thin texture of the shell, the coloured rays, and the greater distance of the beaks from the anterior margin will readily serve to distinguish this species from the young of *M. modiolus*. It differs from *M. barbatus* in its rhomboidal shape, in being much more convex, and its paler colour, as well as in the rays, position of the beaks, sculpture, and epidermis.

M. Adriaticus appears to have been known to Montagu; for in his account of *M. barbatus* he says, "A variety is faintly radiated." The *Modiola tulipa* of Lamarck (for which the British species has been mistaken) is described as a native of the American seas, and a variety of it as coming from New Holland. The tropical shell is of a different shape and substance from ours, and they only agree in the style of colouring. Lamarck pointed out the distinction between them. The present species may be the *Mytilus pictus* of Gmelin (from Bonanni), which is said to inhabit the coasts of Spain; but the diagnosis given by him is too slight for the purpose of identification, and the *Modiola picta* of Lamarck is another species and better known. In Thorpe's 'Marine Conchology' our shell has the appropriate name of "*radiata*," which appears to have been given to it by the late Captain Brown.

5. M. PHASEOLI'NUS *, Philippi.

Modiola phaseolina, Phil. Moll. Sic. ii. p. 51, tab. xv. f. 14; F. & H. ii. p. 186, pl. xliv. f. 3.

BODY reddish-brown: *foot* long and cylindrical: *byssus* strong, light horncolour.

SHELL conformable with its name, obliquely expanding from a blunt point to a rounded edge, remarkably convex and gibbous, rather solid and glossy: *sculpture*, fine but irregular lines of growth: *colour* beneath the epidermis yellow tinged with purple: *epidermis* thick, yellowish-brown and of a darker hue on the sides, exfoliated in all parts except towards the anterior margin, and rising into numerous stiff beard-like points of different lengths, those on the lower part of the ventral side being the finest: *margins* thick, incurved on the ventral side, rounded behind, both these margins being nearly parallel, semicircular in front: *byssal sinus* narrow but distinct: *beaks* small, blunt, and inflected, lying horizontally on the point of the shell, slightly diverging from each other, and placed at a very short distance from the anterior margin: *hinge-line* slightly curved, occupying less than two-fifths of the dorsal margin: *ligament* thick and strong, very little exposed: *hinge-plate* solid, with a deep ligamental groove as in the last species, and the rib is continued within the anterior margin, so as to form a small vaulted chamber below the hinge; inner edge of the dorsal margin finely crenulated across: *hinge* thick and prominent, also finely crenulated or toothed: *inside* nacreous and iridescent, purplish-yellow, and stained with brown on the dorsal side and in front: *scars* indistinct. L. 0·65. B. 0·375.

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* Shaped like a kidney-bean.

HABITAT: On all our coasts, from the extremity of Shetland to the Land's End and Jersey, rather common on rocky and hard ground from low-water mark to 86 fathoms. It appears to be a Coralline Crag fossil, as I observed in Mr. Searles Wood's collection some specimens mixed with the young of *M. modiolus* from that deposit. Steenstrup found it in Iceland; and it has been enumerated by all writers on the Scandinavian mollusca as occurring from Vadsö (near the North Cape) southwards at depths ranging from 30 to 160 fathoms. A living specimen has been taken at Cannes by M. Macé. It was first described by Philippi from the upper tertiary beds of Calabria and Sicily.

The animal is rather active when detached from its byssus, using its extensile foot for creeping like its congeners, and moving with considerable agility. It often invests itself in a case of gravelly and shelly fragments. The fry are of a rhomboidal shape. The size of adult specimens does not appear to exceed three-quarters of an inch, those from the south being much smaller than northern ones. The shell resembles that of *Modiolaria* in the denticulation of the dorsal margin. It differs from the young of *M. modiolus* in having this peculiar character, as well as in being much thicker, more convex, of a darker colour, and angulated behind.

Allied to *M. phaseolinus* in respect of the denticulated hinge and dorsal margin is the *M. crenatus* of Lamarck, which was imported in 1816 into Portsmouth harbour on the bottom of H. M. S. Wellesley from Bombay; but it has not become naturalized. *M. bidens* of Linné and *M. Africanus* of Chemnitz were subsequently introduced in the same manner, and with a like result, into Scarborough and Plymouth. The former is a West-Indian, and the latter a West-African species. *Modiola agglutinans* of Cantraine (*M. vestita,* Philippi) is *said* to have been once found in Ardmore Bay, near Youghal, and was described by Captain Brown under the name of *Modiola Ballii.* It is a Mediterranean species. The *Mytilus* (*Lithodomus*) *aristatus* of Dillwyn was found many years ago in a piece of ballast limestone imported into this country from the West Indies, and was formerly included among British shells.

Genus II. MODIOLA'RIA *, Beck. Pl. III. f. 3.

Body suboval: *mantle* folded in front into a wide incurrent tube, and behind into a conical excurrent tube: *foot* strap-shaped.

Shell rhomboidal, sculptured by two rows (one on each side) of striæ which radiate from the beaks, leaving the middle portion smooth: *beaks* incurved: *hinge* mostly toothless, but sometimes crenulated: *hinge-plate* finely notched.

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* Allied to the genus *Modiola* of Lamarck.

This genus differs from *Mytilus* in the mantle being folded into a distinct tube for the supply of food and aërated water, as well as in the remarkable sculpture of the shell. The hinge-plate is crenulated as in *Mytilus phaseolinus*. The foot is very flexible and extensile; and when fully stretched out, it is two or three times as long as the shell, and becomes almost thread-shaped. The animal can crawl rather fast along a level surface by extending and fixing the point of its foot in front, using it as a fulcrum, and then dragging itself forwards; and it occasionally floats on its back like *Kellia suborbicularis* and other small bivalves. One species (*M. marmorata*) burrows into the tunic or outer coat of Ascidians, and others form nests or wrapping-cases with the aid of their byssus. It would seem, however, that the European habit of infesting Tunicata is not possessed by any Transatlantic species.

Although Beck has the credit of founding the genus *Modiolaria*, and it has been adopted by Lovén, Middendorff, and other writers on the northern mollusca, it has never been described or characterized by any of them. The same remark applies to the genera *Lanistes* of Humphreys and *Lanistina* of Gray, both of which are synonyms of the present genus. *Modiolaria* may be distinguished from Brown's genus *Crenella* by the shell of the latter being covered all over with striæ or ribs, and by its having a strong and crenulated tooth in the hinge of each valve. The animal also differs in some important particulars, which will be presently noticed. Whether all these differences are generic or subgeneric, may be a moot question; but as the lines of demarcation between any one group of animals and those on each side of it in the same family are never capable of being precisely defined, it is obviously undesirable to encumber our system of classification with more divisions and names than are necessary to separate and recognize the species contained in such group.

1. MODIOLARIA MARMORA'TA *, Forbes.

Mytilus marmoratus, Forb. Mal. Mon. p. 44. *Crenella marmorata*, F. & H. ii. p. 198, pl. xlv. f. 4.

BODY thick, pale-yellow: *incurrent tube* large and bag-shaped, formed of two pendulous puckered flaps of the mantle, mottled with purplish- or reddish-brown and white flakes; margin plain: *excurrent* (or anal) *tube* small and conical, of the same colour as the larger tube, furrowed at the base, and having the mouth or opening fringed with four or five minute dark cirri: *foot* white, very long and almost cylindrical, with a deep byssal groove: *byssus* semitransparent but strong.

SHELL oval, very gibbous and obliquely angular, rather thin, glossy, and somewhat iridescent: *sculpture*, 15–18 longitudinal ribs on the anterior side and 20–25 on the other side; these ribs or striæ occupy the two sides only; the intermediate space is smooth, with the exception of very fine and crowded transverse lines, which traverse the whole surface and give the ribs an appearance of being minutely punctured: *colour* yellowish, irregularly mottled with purplish- or reddish-brown spots or blotches, sometimes forming zigzag streaks, occasionally of a uniform orange hue: *epidermis* light green: *margins* rounded and obliquely truncate at the anterior end, nearly straight and slightly gaping on the ventral side, wedge-shaped or bluntly pointed at the posterior end, whence they slope backwards with a gentle curve to the dorsal angle or hinge-line: *byssal sinus* long and narrow: *beaks* small, swollen, inflected (as in the genus *Verticordia*), and divergent, placed near the anterior margin: *ligament* thick and strong, yellowish-brown, nearly concealed in the embrace of the hinge-plate: *hinge-line* slightly curved, occupying the whole of the dorsal margin: *hinge-plate* strengthened by an internal rib and receiving the ligament in a shallow groove; it is obliquely and finely crenulated: *hinge* reflected and deeply indented: *inside* nacreous and iridescent, notched all round the edge, except on the ventral side: *muscular scars* slight and scarcely perceptible. L. 0·75. B. 0·45.

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* Marbled.

HABITAT: Imbedded in the skin or outer integument of *Ascidia mentula* and other simple Tunicata, or attached by its byssus to old shells, in the Laminarian and Coralline zones on all our coasts. It is by no means rare; and sometimes a score of specimens may be extracted from a large Ascidia. In a fossil state it occurs in the Red and Coralline Crag. The limits of its foreign distribution comprise the sea-bed lying between Finmark and the Ægean, and reach westward to the Canaries. On the Norwegian coast Asbjörnsen has given 10, and Danielssen 150 fathoms as its bathymetrical range. It has not been quoted in any list of Icelandic, or of North American shells.

On being dislodged from its usual place of abode, *M. marmorata* puts out its foot and feels its way in search of another retreat; and when it has found one to its liking, it immediately spins a byssus and securely fastens itself, sometimes on or within the fold of a seaweed, or in the crevice of a stone. I have seen it (as if acting on a sudden impulse, or disliking to be watched) detach itself from its mooring and set out again on its travels to select a more sheltered or suitable spot. The genesis or development of the animal has been fully and most ably elucidated by Lovén.

This species used to be called the *Mytilus discors* of Linné; and it is not improbable that in his description he included it with the *Mytilus discrepans* of Montagu, which we now refer to Linné's species. But the epithet "fusca" in the 'Systema Naturæ' is scarcely applicable to the present species; and as one of the localities given by Linné, on the authority of his pupil Zoega, is Iceland (where *M. marmorata* has not since been found), it may be on the whole better to confine the specific name of *discors* to the other species. Leach was, I believe, the first to call in question the identity of *M. marmorata* with the *Mytilus discors* of Linné. In his monograph of the genus *Modiola*, published in the 'Zoological Miscellany' (vol. ii. p. 56), he says, as to the species in one section, "Montagu described two species as natives of Great Britain: one he named *M. discors* (but I am by no means satisfied that it is the *discors* of Linné); the other, which is a very distinct species, *discrepans*." The change of name afterwards proposed by Forbes was not effected without much opposition. Philippi called it *Poliana*, in the Supple-plement to his work on the Sicilian Mollusca, in the 'Zeitschrift für Malakozoologie' for June 1844; Hanley substituted another name (*tumida*), in his Appendix to Wood's 'Index Testaceologicus'; and D'Orbigny afterwards added a fourth, viz. *Europæa*. Lamarck had described it in 1819 as *Modiola discrepans*. If the Linnean collection of shells had been preserved intact, instead of being so often and so carelessly disarranged and rearranged by Sir James Smith's pupils and various other persons, it might have helped to explain some of the short and doubtful descriptions contained in the 'Systema Naturæ' and other works of the great Coryphæus of northern naturalists, and would have prevented much of the confusion which has prevailed with regard to the species above alluded to. Even the numbers marked on some of the specimens, with reference to those works, cannot be identified with the handwriting of Linné; and it is extremely rare to find a case where the name has been so inscribed.

2. M. COSTULA'TA*, Risso.

Modiolus costulatus, Risso, Hist. nat. l'Eur. mérid. iv. p. 324, f. 165.
Crenella costulata, F. & H. ii. p. 205, pl. xlv. f. 1.

SHELL oblong, narrower at the anterior than at the opposite end, convex, rather thin, and glossy: *sculpture*, about 10 ribs on the anterior side and twice as many on the other side; middle area somewhat depressed, destitute of ribs, but the whole surface of the shell is marked by very numerous and wavy transverse striæ, which gives it a silky appearance: *colour* cream-white, beautifully mottled with rich purplish-brown streaks often arranged in a zigzag pattern: *epidermis* thin, light green: *margins* rounded at the anterior end, nearly straight or slightly incurved on the ventral side, broad and rounded at the posterior end, and forming a gentle curve on the dorsal side: *beaks* small, inflected and divergent, not so much swollen as in *M. marmorata*, nor placed so near the anterior margin: *byssal sinus*, *ligament*, and *hinge-line* as in that species: *hinge-plate* strengthened by an internal rib or ledge and strongly toothed; ligamental groove narrow: *hinge* reflected and slightly indented or notched: *inside* highly nacreous, and of a deep purplish-brown except at the edge, which is finely crenulated on the anterior and posterior sides: *scars* indistinct. L. 0·4. B. 0·2.

HABITAT: Under stones and among small sea-weeds in rock-pools at low spring-tides on the south coasts of Devon and Cornwall; Herm (Macculloch); Oxwich Bay, near Swansea (J. G. J.); and Bundoran, co. Donegal (Waller). It is rather local, but not uncommon. Searles Wood has found it in the Red and Coralline Crag. It appears to be a southern form, and to range from Brittany (Macé) to Sicily (Philippi) and the Canaries (Webb and Berthelot).

This very pretty shell differs from *M. marmorata* in being less gibbous or tumid, much narrower, and of a brighter and more variegated colour; the posterior margin is regularly curved instead of obliquely wedge-shaped; the central area is depressed; and the beaks are placed at a greater distance from the anterior margin. Mr. Dennis says that it is frequently imbedded in a very snug little nest on sea-weeds, but never among their roots, where *M. discors* takes up its abode and occurs in great numbers. My largest specimen is half an inch long; but I believe it is usually very much smaller, and that in cubical contents it is not a tenth of the last species.

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* Slightly ribbed.

3. M. DIS'CORS*, Linné.

Mytilus discors, Linn. Syst. Nat. p. 1159. *Crenella discors*, F. & H. ii. p. 195, pl. xlv. f. 5, 6; and pl. xlviii. f. 5.

BODY yellowish-white, with a few scattered minute specks of flake-white: *incurrent tube* formed by a wide protuberant slit of the mantle in front for the admission of food and water: *excurrent tube* conical, and projecting considerably beyond the shell at the posterior or broader end: *foot* strap-shaped, capable of being extended more than twice the length of the shell, and used (like that of *Mytilus edulis*) for crawling.

SHELL oval, much broader than either of the other species above described, somewhat compressed, rather thin, usually not glossy: *sculpture*, 10–12 remote ribs on the anterior side, and 30–40 close-set ribs on the other side; middle area depressed and smooth; transverse striæ very minute and fine: *colour* yellowish-brown: *epidermis* rather thick, light green: *margins* rounded on all sides, except the ventral, which is nearly straight: *beaks* small, rather prominent, incurved and diverging, placed near the anterior margin: *byssal sinus*, *ligament*, and *hinge-line* as in the other species: *hinge-plate* strengthened by an internal rib, and obliquely and strongly toothed; ligamental groove narrow: *hinge* slightly reflected and thickened, crenulated: *inside* highly nacreous, purplish-yellow or liver-colour, with the anterior and posterior edges finely notched: *scars* rather distinct. L. 0·5. B. 0·35.

Var. 1. *angustior*. Shell smaller, narrower, and more glossy.

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* Disagreeing.

Var. 2. *semilævis*. Shell narrower, yellowish-horncolour; ribs on the posterior area slight and scarcely perceptible. L. 0·175. B. 0·1.

HABITAT: Gregarious at the roots of seaweeds (especially *Corallina officinalis*) between tide-marks, and in the Laminarian zone everywhere from Shetland to the the Channel Isles. Var. 1. Southampton (J. G. J.); estuary of the Orwell, Suffolk (Clarke). Var. 2. Staffa (Alder). Some specimens from Lismore near Oban also have no trace of ribs on the upper part of the posterior area. Having had an opportunity of carefully examining and comparing an extensive series of specimens of *Modiola lævigata*, Gray, and the variety *substriata*, from different parts of the Arctic seas, I am convinced that they are not distinct from the present species. The gradual passage from any one of these forms to another is very evident, if a sufficient number of examples of all ages and from many localities are submitted to the inspection of a tolerably practised observer; and the deplorable fashion of species-making might be in some measure restrained by adopting this method in all cases, instead of selecting a few particular specimens and discarding young shells and those which offer inconvenient proofs of transition. As an upper tertiary fossil the variety *lævigata* has been found at Elie in Fifeshire by the Rev. Thomas Brown, and the typical form occurs in the mammalian bed at Chillesford. It has a wide extra-British range, from North Greenland and New England to the Ægean.

This little creature is a very industrious seamstress; for Mr. Alder says it "forms for itself a kind of nest or case by stitching together the small seaweeds or corallines with its byssal threads." Forbes and M'Andrew dredged it at a depth of 30 fathoms in the Irish Sea, off

Anglesea, in the line of strong currents, enveloped in similar nests. Dr. Gray has observed that "it creeps with the foot on the surface of the water, with the shell downwards like a *Cyclas*, and it has the power, like that genus, of crawling up the smooth surface of glass or china." The old northern writers called it "anatum cibus," its littoral habitat rendering it a tempting prey to wild-fowl. According to Fabricius it is eaten, although seldom, by the Greenlanders.

The meaning of the specific name has reference to the opposite direction in which the two sets of ribs or striæ appear to diverge. It is to be regretted that this discordance has extended to the synonymy. Montagu called the present species *Mytilus discrepans*; and more than ten years afterwards Lamarck used the same name for *Modiolaria marmorata*, as well as for *M. impacta*, a tropical shell.

4. M. NI'GRA*, Gray.

Modiola nigra, Gray, Supp. to App. to Parry's First Voyage to the North Pole, p. ccxliv. *Crenella nigra*, F. & H. ii. p. 202, pl. xliv. f. 5, and (animal) pl. Q. f. 7.

BODY "of a transparent white hue, with the margin of the cloak and siphon tinged with pink, and speckled with brown and opaque white." (Alder.)

SHELL oval, inclining to oblong, compressed, rather thin, moderately glossy and slightly iridescent: *sculpture*, about a dozen remote ribs on the anterior side, and 50–60 close-set and thread-like ribs on the other side, which latter become finer towards the middle of the shell; ventral area not depressed, but without ribs; transverse striæ numerous, coarse, and flexuous, sometimes forming tubercles or a rough network where they intersect the longitudinal ribs: *colour* purplish-brown: *epidermis* rather thick, fawn-colour in the young, olive-green at a subsequent stage of growth, and dark brown or even pitch-black in aged examples: *margins* rounded on all sides except the ventral, which is nearely straight: *beaks* small, prominent, incurved, and diverging, placed at some distance from the anterior margin: *byssal sinus, ligament,* and *hinge-line* as in the other species: *hinge-plate* strengthened by a rib to receive the ligament, and finely notched; ligamental groove narrow and deep: *hinge* crenulated: *inside* highly nacreous, purplish-brown, finely notched on the anterior and posterior edges, and showing the impressions of the ribs as well as faint traces of similar but finer striæ on the middle area: *scars* distinct. L. 1·5. B. 0·65.

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* Black.

HABITAT: Muddy gravel, at depths varying from 7 to 90 fathoms on the coasts of Yorkshire, Northumberland, and Durham, both sides of Scotland, and the Shetland Isles. Although not generally distributed, it is not uncommon in some places, and in the Firth of Forth it is called by the fishermen the "corduroy mussel." The Dogger bank appears to be its southernmost limit in our seas. The Rev. H. W. Crosskey found a single valve in a postglacial bed in the Kyles of Bute. Meyer and Möbius obtained specimens by dredging in the bay of Kiel, on the German coast of the Baltic, whence the species ranges northwards along the Scandinavian shores to Nova Zembla on the east, and Iceland on the west. On the other side of the Atlantic it inhabits the coasts of Greenland, Newfoundland, New England, and Massachusetts.

This fine species may be at once known from *M. discors* by its sculpture. There are nearly twice as many ribs on the posterior area, and the transverse striæ or wrinkles are so coarse as to give a granular appearance to that part of the shell. Besides, the anterior margin is more produced, and consequently the beaks recede further from that extremity. The fry are quite smooth and have a prismatic lustre. The largest specimens I have seen were lately procured on the Durham coast, one of them measuring nearly two inches and a half in length.

Chemnitz and Fabricius considered it to be a variety of *M. discors*; and Montagu noticed it as a large form of his *Mytilus discrepans*. Leach, in his 'Zoological Miscellany,' excellently described it by the last-mentioned name; and he referred the Devonshire specimens of *M. discors* to a small variety of the same species. This was many years before Gray's publication; and perhaps, in strict justice, the name of *discrepans* ought to be restored and applied to the present species. But I will mercifully abstain from increasing the perplexity which has so long involved the nomenclature of the *Modiolariæ*.

Genus III. CRENE'LLA*, Brown. Pl. III. f. 4.

Body roundish-oval: *mantle* open in front, and folded behind into a sessile excurrent tube: *foot* worm-shaped, the point being disk-like and issuing out of a sheath.

Shell oval or rhomboidal, cancellated by longitudinal ribs and transverse plates: *beaks* straight: *ligament* small: *hinge* of each valve furnished with an upright tooth, which is crenulated as well as the hinge-plate.

The name of this genus was probably derived from the circumstance of the hinge-plate being slightly notched. The shell is entirely composed of nacre, and has a silvery hue when deprived of the epidermis: in this respect it resembles that of *Nucula*. The animal is unlike that of *Modiolaria*. It has the mantle completely open in front, instead of being folded into a special tube for the entry of food and water; the excretory tube is exceedingly short, and sessile, instead of being produced and conical; and the foot is a very extraordinary organ. This is formed of two parts: one is the stalk, of a cylindrical form; and from the upper end of it, as if from a sheath, issues a tongue-shaped disk which serves for crawling. The animal does not spin a thick byssus, like *Modiolaria*, but secretes only a single slight thread or filament as a point of attachment, and by means of which it holds itself suspended in the water.

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* A little notch.

Herrmannsen supposed that the genus was synonymous with *Limopsis* and belonged to the *Arcidæ*. Macgillivray placed it with *Lima* and *Anomia* in his family *Pectinina*.

1. Crenella rhom′bea*, Berkeley.

Modiola rhombea, Berk. in Zool. Journ. iii. p. 229. *C. rhombea*, F. & H. ii. p. 208, pl. xlv. f. 3.

Shell obliquely rhomboidal, gibbous, rather solid, somewhat glossy and iridescent: *sculpture*, 60–70 fine longitudinal ribs, crossed by 12–15 transverse plates; the former radiate from the direction of the beaks, and occasionally bifurcate or branch off towards the margin; the latter form imbricated ridges, and are stronger on the posterior slope: *colour* pearl-white: *epidermis* extremely thin and easily rubbed off, pale yellow: *margins* truncate or obtusely rounded on the anterior side, slightly incurved in front, produced into a semicircular lobe on the posterior side, and forming a wing or arched crest behind: *byssal* sinus small: *beaks* globular and prominent, placed close to the anterior margin, minutely striate in a transverse direction, but not sculptured in any other way: *ligament* narrow but thick, yellowish-brown, occupying about two-thirds of the hinge-line: *hinge-line* straight: *hinge-plate* rather broad and strong, finely crenulated: *hinge* furnished with a rather large wedge-shaped serrated tooth in each valve, one of which interlocks within the other: *inside* nacreous and glossy, showing distinctly the impression of the ribs; inner margins notched all round: *muscular scars* very slight. L. 0·13. B. 0·2.

Habitat: Rocks and gravelly bottoms, from low-water mark to 20 fathoms, on the coasts of Cornwall, Devon, Dorset, and the Channel Isles. The collection of Mr. George Humphreys, the well-known dealer in shells, made in the last century, contained a single valve labelled "Ireland"; but if the locality was correctly stated, this species has not been rediscovered there. I am only aware of a few (ten) places where it has been discovered in England, though it is tolerably common at Lulworth and Guernsey. Single valves are very abundant in the Coralline Crag at Sutton. M. Martin has found it in the Gulf of Lyons, and Mr. M'Andrew in the Gulf of Tunis and the Canary Isles.

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* Rhomboidal.

Dr. Lukis informed me that some of his finest specimens were taken alive in a rock-pool lying immediately below half-tide mark on the western shore of Guernsey. They occupied a chink in the rock a little under the surface of the water. The transverse ridges perhaps denote the annual growth of the shell. The fry are so totally dissimilar from the adult, that I was misled into describing and figuring the former under the name of *Limopsis pellucida* in the 'Annals and Magazine of Natural History' for January 1859. They are smooth and oval, resembling a minute *Ungulina* in shape; the hinge is placed exactly in the middle of the dorsal margin; and the arrangement of the teeth or crenulations on the hinge-line further indicates the affinity of *Crenella* to *Nucula*.

Dr. Leach admirably described this lovely and remarkable shell in his 'Zoological Miscellany' (1814) as "*Modiola Prideaux*." Unfortunately the termination of the specific name is not in accordance with the rules of zoological nomenclature, and it must therefore be rejected. It is true that Capt. Brown altered the name to *Prideauxiana* in his 'Illustrations of British Conchology,' published in 1827, being the same year as that in which Mr. Berkeley's notice appeared in the 'Zoological Journal,' a circumstance that undoubtedly must have some weight with a scientific jury; but after considering the whole case, and taking into account the positive disadvantage which would result from a change of any name that has been generally recognized, I must give my verdict in favour of Mr. Berkeley. This species is the *Modiola asperula* of Searles Wood's Catalogue of Crag fossils.

2. C. DECUSSA'TA*, Montagu.

Mytilus decussatus, Mont. Test. Brit. Suppl. p. 69. *C. decussatus*, F. & H. ii. p. 210, pl. xlv. f. 2.

BODY greyish-white: *mantle* quite open in front, and folded at the posterior or broader end of the shell to form an excretory tube; edges fringed with very short and minute glistening cilia, which correspond with the ribs of the shell: *tube* very short and sessile, with a plain margin: *foot* worm-shaped, consisting of a long stalk with a sheath at the end, from which proceeds an oval creeping-disk.

SHELL obliquely oval, with a slight approach to a rhomboidal form when viewed sideways, rather solid, somewhat glossy and prismatic: *sculpture*, 50–60 fine longitudinal ribs, crossed by 40–50 transverse striæ; the former resemble those of the last species; the latter are thread-like and form minute nodules or beads on the ribs at the points of intersection: *colour* pearl-white: *epidermis* rather thick and yellowish-brown: *margins* rounded on all sides except at the back, where an obtuse angle separates the hinge-line: *beaks* globular and prominent, placed close to the anterior margin, over which they slightly project; they are quite smooth, with the exception of some delicate transverse striæ: *ligament* thick, reddish-brown: *hinge-line* nearly straight: *hinge-plate* rather broad, finely crenulated: *hinge* toothed as in the last species: *inside* nacreous, showing more or less distinctly the impression of the ribs; inner margin notched all round: *scars* more perceptible than in *C. rhombea*, owing to the greater thickness of the inner coat of nacre. L. 0·15. B. 0·12.

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* Divided crosswise.

HABITAT: Coasts of Yorkshire, Northumberland, Antrim, and Scotland from the Clyde district and Firth of Forth north to the Shetlands, in gravelly sand from 3 to 70 fathoms. It appears to be gregarious. Post-glacial deposit at Elie, Fifeshire (Rev. T. Brown). It inhabits the seas of Scandinavia, Iceland, Greenland, and New England, occurring at various depths from low-water to 150 fathoms.

This exquisite gem of a mollusk is hardy and active. Not being able to examine living specimens at the time they were taken, I picked out a few from a small heap of dredged sand, which had been lying on a pathway for two days, exposed to continual rain and partly trodden underfoot. After keeping them eighteen hours in a small glass vessel of sea-water, they revived and were alive for many days, the water being occasionally renewed. While crawling about, they sometimes carried the shell erect with the beaks in front, but more frequently in a slanting position. They seemed fond of getting to the surface of the water, when the *Crenella* would spin with its foot a single pellucid thread, which it fixed to the side of the vessel, and it would hang (like a *Sphærium*) for hours thus suspended, the beaks of the shell being undermost. The shell being nearly transparent during the lifetime of the animal, the green liver is distinctly seen through it, occupying the umbonal region. The foot-stalk or pedicle is semicylindrical, and becomes twisted if the animal is placed on the wrong side. The creeping-disk or lobe is very flexible and in some degree extensile. It is half as broad again as the stalk, and proportionally thicker. A dusky line runs down the middle of the stalk, apparently showing the muscle which connects the terminal lobe with the basal attachment of the foot to the body. While the animal is crawling a tremulous movement is seen to pervade the lobe. The stalk and sheath are faintly wrinkled across. The foot is protruded from the ventral opening in the mantle, and extends in a direction opposite to that of the beaks.

Col. Montagu described and established this species from a single valve, which was found by his friend Capt. Laskey at Dunbar; but he erroneously supposed it might be the *Mytilus faba* of Müller. It is the *Modiola cicercula* of Möller, but not the *M. glandula* of Totten, which latter species (as Sars has remarked) is more rhomboidal and broader, besides being three or four times the size of our shell. *C. glandula* and *C. faba* are more nearly allied. The *Mytilus decussatus* of Lamarck is a large South American mussel.

Two specimens of *C. faba* were procured some years ago by Professor King from the stomach of a wild duck that was shot near Newcastle; and one of them is in my collection. This shell is common in the arctic zone on both sides of the Atlantic. The bird may have picked up the shells in upper Norway or Iceland; and better evidence is wanting before *C. faba* can be admitted into the British fauna.

Another species, however, of a much more novel and interesting kind has been taken on our northern coasts under similar circumstances. During the severe winter of 1855 several birds of passage were killed near Scarborough. One of them came into the possession of Mr. Alfred Roberts, an intelligent bird-stuffer, who found a number of small shells in its crop. These he gave to Mr. Bean, and they proved to be the young of *Mytilus edulis* and *Littorina litorea,* and an unknown bivalve. Mr. Bean kindly sent me a specimen of the latter, and I described it in the 'Annals and Magazine of Natural History' for January 1859 (p. 40) under the name of *Modiola cuprea*. I subjoin the description:—

"Testa ovato-trapezoidea, gibbosa, solidula, nitida, epidermide prismatica, fulva (antice flava), pilosa vestita, subtus albida, rugis concentricis raris irregulariter notata; angulo transversali ex apicibus ad latus posticum oblique decurrente; umbonibus obtusis; lateribus, dorsali rectiusculo elevatiore postice rotundato, antico abrupte truncato, ventrali convexo subsinuato antice declivi, posteriore quadrato; marginibus integris; bysso ex filis perpaucis curtis crassulis composito; long. $\frac{1}{6}$, lat. $\frac{1}{8}$ unc."

But this description is incomplete, inasmuch as no mention is made of the internal structure of the hinge. Having succeeded in opening the shell, after steeping it for a long time in water, I am now enabled to supply this deficiency; and the result has compensated for the care and patience bestowed on the operation. Each valve has on the anterior side of the beak four small but prominent tubercular teeth, and on the posterior side the same number of angular teeth, which are set obliquely and resemble in shape those of *Nucula* or *Leda*. The hinge-line is microscopically but indistinctly notched, as in *Crenella* and some species of *Arca*. I do not know if this peculiar arrangement of tubercular teeth on one side and of lamellar teeth on the other side of the hinge has any parallel in bivalve shells, unless it be the genus *Nuculocardia* of D'Orbigny. The little shell in question is evidently littoral, judging from the habits of the other species which were found with it in the bird's stomach. From what coast, or from what part of the northern hemisphere, it was brought to our shores, it is almost impossible to conjecture. The animal was preserved in my specimen, and does not seem to have undergone the least decomposition; and the shell still retains its original colour and gloss. The species has not been noticed by any other writer, nor have I detected anything approaching it in the extensive collections made by Dr. Torell on the coasts of Iceland, North Greenland, and Spitzbergen. There is some doubt as to the kind of bird from whose crop the shells were extracted. Mr. Bean asserts that that it was a Sanderling. Mr. Roberts is equally positive that it was a Brent-goose; and he supports his statement by the following domestic anecdote. Having heard that a Brent-goose was excellent eating, he depended on this bird for his Sunday dinner; but, to his disgust, when his wife was preparing it for the spit, it smelt so very "loud," that bread and cheese had to be substituted. He attributed the smell to the decaying *Ulva* on which the bird had fed, and among which were the shells he had given Mr. Bean. Mr. Roberts therefore had good reason for remembering what bird it was that caused so much pleasure to Mr. Bean, but disappointment to himself. Several specimens of this singular bivalve were taken on the above occasion. It is figured in Sowerby's Illustrated Index to British Shells, pl. 7. f. 11.

Family VI. AR′CIDÆ, Lowe.

Body thick, corresponding in shape with the shell: *mantle* open in front, but in some genera forming a single fold or two tubes at the posterior end: *gills* two on each side, arranged in pairs: *foot* shaped like a disk, worm, axe, or tongue, capable of burrowing, creeping, or spinning a byssus.

Shell triangular, oval, wedge-shaped, round, oblong, or rhomboidal, equivalve, inequilateral: *epidermis* thick: *ligament* external; certain genera have an internal *cartilage* in addition to, or subtitution of, the ligament: *hinge-plate* furnished with a row of close-set teeth in each valve, which mutually interlock: *muscular scars* lateral, deep or distinctly marked.

The old and characteristic genus *Arca* of Linné has multiplied so fast since his time, that it now forms a very numerous family. The quota which has been contributed to it by palæontology, or the record of extinct races and generations, is nearly equal to that of recent genera; and in this sense the march of science may be said to advance with almost the same rapidity in a retrograde as in a forward direction. Both zoologists and palæontologists are strenuous in the race; but instead of being hostile rivals, the only object of their emulation is to assist each other and thus promote the common cause.

The character which makes this group (whether we regard it as a genus, a family, or a set of families) so distinct and self-contained is the peculiar structure of the hinge. Instead of having, like other bivalves, only one, two, three, or, at the most, four tubercular teeth under the beak, and occasionally a single or double laminar fold on each side, all the *Arcidæ* are furnished with a symmetrical row of these processes, occupying the whole of the hinge in each valve, and interlocking like the real teeth of many kinds of fish. This apparatus, aided by stout retractor muscles and an elastic ligament, and in some genera by a strong internal cartilage, enables the mollusk to keep its house closed against most of its predatory enemies; and it is only when the shell is drilled by some canaliferous Gasteropod, or else swallowed whole by a voracious fish or by a member of the *Bulla* family, that its days are numbered. Those species of *Arca* which habitually shelter themselves in the crevices of rocks, and are attached by a solid byssus, may escape this doom for a longer period. The thickness and apparent longevity of specimens of *A. tetragona* and *A. lactea* may be thus accounted for. Lamarck proposed the expressive name of "Polyodontes" for the present family. According to Dr. Carpenter, a microscopical examination of the shell shows in many of the genera a tubular structure intersecting the upper layer and spreading outwards, the lower or inside layer being nacreous.

The *Arcidæ* may be conveniently divided into two sections, viz.

† Shell triangular or wedge-shaped: *epidermis* smooth and glossy: *beaks* close together and recurved: *hinge* furnished with a row of teeth set like those of a comb, on each side of an oblique spoon-shaped process, which contains a cartilage.

* Shell triangular.

1. NUCULA.

** Shell wedge-shaped.

2. LEDA.

†† Shell round, oblong, or rhomboidal: *epidermis* hairy or fibrous: *beaks* separated by the ligamental area, and incurved: *hinge* furnished with a single continuous row of plate-like teeth, destitute of an intermediate cartilage or pit.

* Shell round.

3. LIMOPSIS.
4. PECTUNCULUS.

** Shell oblong, or rhomboidal.

5. ARCA.

Genus I. NU'CULA *, Lamarck. Pl. IV. f. 1.

Body roundish-oval, somewhat compressed: *mantle* open in front and at both sides: *gills* unequal in size, one pair overlapping the other: *lips* or palpi long and pendulous: *foot* oval and having its margin serrated or notched.

Shell triangular and compressed, highly nacreous: *margin* of the posterior side rounded: *lunule* or area below the beaks heart-shaped: *ligament* partly internal: *cartilage* internal and contained in a spoon-shaped cavity: *teeth* sharp and recurved, those on the anterior side being fewer than those on the other side: *pallial scar* entire.

The *Nuculæ* inhabit mud, sand, and gravel in all the marine zones on our coast; and they appear to be gregarious. They are found in every degree of longitude and latitude throughout the globe. The umbonal area, or that part of the shell which is terminated by the beak, is often eroded and the nacreous layers exposed, probably owing to the action of sulphuretted hydrogen, which is evolved from animal matter in a state of decomposition contained in the mud. Sometimes the beak is encrusted with a ferruginous or mineral deposit. The lunule in the present genus and *Leda* projects considerably, so as to resemble a pair of pouting lips. Each organ (in the mollusk as well as in Woman) encloses a row of dazzling white teeth. But here the analogy ends. Such comparisons of natural beauty constitute one of the minor charms of science, and may be pardoned in an enthusiastic naturalist.

I am not prepared to accept D'Orbigny's proposition, which has been adopted by Gray and other conchologists, that this genus ought to form a distinct family. The genus *Nuculana* of Searles Wood resembles *Nucula* in shape, but has teeth like those of *Pectunculus*, and no cartilage; while *Limopsis* has the form of *Pectunculus,* with a cartilage and a cavity for its reception, as in the so-called *Nuculidæ,* although placed differently, viz. outside the hinge, instead of in the middle of it. Stimpson advocates the separation of *Nucula* from the *Arcidæ* because of the want of a byssus; but *Pectunculus* has none. This appendage is only necessary when the habitation is rocky or "hard." In sandy and muddy, or "soft" ground the foot is used for burrowing, instead of spinning a byssus; and it is consequently larger in *Nucula, Leda, Limopsis,* and *Pectunculus,* which live in such situations, than in *Arca,* which attaches itself to rocks and old shells. Récluz suggested the removal of *Leda* from the *Arcidæ* and *Nuculidæ,* and considered that all of them belonged to different tribes; but our progress in classification has not yet advanced sufficiently to allow of such extreme subdivision. Gray placed *Nuculidæ* between the families represented by *Solen* and *Mya,* and in another order than that which contains *Arca, Pectunculus* and *Limopsis.* Leach's arrangement is rather more eccentric or opposed to general views. His families of *Nuculadæ* and *Pectunculidæ* lie between *Mactra* and *Venus,* and his *Arcadæ* (*longo intervallo*) between *Pinna* and *Avicula.* The late Mr. G. B. Sowerby was the first to point out the separation of *Leda* and *Nucula* from *Arca.*

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* A small nut.

A. Inner margin notched.

1. NUCULA SULCA'TA*, Bronn.

N. sulcata, Bronn, Italiens Tertiärgebilde, p. 109, no. 633. *N. decussata,* F. & H. ii. p. 221, pl. xlvii. f. 1–3.

SHELL obtusely triangular, rather convex, solid, of a dull hue: *sculpture,* numerous transverse striæ or ridges, which

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[*] Furrowed.

are crossed by finer longitudinal striæ or ribs, giving the surface a cancellated appearance; these markings are coarser and more irregular at the sides, but they do not extend to the lunule or space below the beaks: *colour* flake-white under the *epidermis*, which is thickish, olive-green, and microscopically striate like hair-cloth in a transverse direction: *margins* angular and slightly truncate on the anterior side, curved in front, and expanding on the posterior side to a wedge-shaped but rounded angle: *beaks* rather prominent and blunt, slightly recurved: *lunule* furrowed obliquely by strong and irregular wrinkles (being a continuation of the transverse striæ), and indented or grooved in the direction of the beaks; it is separated from the rest of the shell by a ledge, and projects in the middle so as to form a distinct keel: *ligament* narrow but strong: *cartilage* small, pear-shaped, contained in a narrow cavity underneath the beaks and projecting inwards: *hinge-line* gently curved: *hinge-plate* broad and strong, occupying the whole of the dorsal space and rather more than one-third of the circumference of the shell: *teeth* sharply pointed, 10–12 on the anterior side and 20–24 on the posterior side of the cartilage-pit, arranged in nearly straight rows, which diverge outwards at almost a right angle; they become larger as they recede from the beak, in consequence of the progress of growth: *inside* cream-colour and slightly iridescent, faintly striated, or marked with lines which radiate from the beak and terminate in distinct notches or crenulations on the anterior angle and in front; but these notches do not extend to the posterior angle: *muscular scars* oval and conspicuous. L. 0·65. B. 0·7.

HABITAT: Sandy mud and clay on the west coast of Scotland, at various depths, as well as in Dublin Bay (Branscombe and Warren); Bantry Bay (Humphreys); and south-west coast of Ireland (M'Andrew). Captain Bedford has dredged it in a semifossil state at Lismore, imbedded in a concrete of indurated clay. It is a local species. Lovén, Asbjörnsen, and Malm have recorded it from several parts of the Scandinavian coasts, the second of these authors giving 15–20, and the last 14–35 fathoms. It also inhabits the coasts of Spain and both sides of the Mediterranean, as well as the Ægean, where

Forbes obtained it at depths varying from 45 to 145 fathoms. Bronn and Philippi have described it as a fossil of the Subapennine tertiaries; and I have found it in upper miocene strata at Biot near Antibes.

This is the largest British species of *Nucula*. It can hardly be the *N. decussata* of Sowerby's 'Conchological Illustrations,' because the description and figure do not answer to our shell, and that species is stated to have come from the Gulf of Guinea. It may be his *N. rugulosa,* which is said to be of the size of *N. nitida,* although the locality is not mentioned. At all events Bronn's name has the precedence of many years over those of Sowerby. Philippi described, in the first volume of the 'Sicilian Testacea,' the present species under the name of *N. Polii*. Bronn's diagnosis exactly agrees with our shell; and he justly observes that it is larger and broader than *N. nucleus*. In the 'Proceedings' of the Zoological Society for 1856, another species from New Zealand has been called, by Mr. A. Adams, *N. sulcata*.

2. N. NU'CLEUS*, Linne.

Arca nucleus, Linn. Syst. Nat. p. 1143. *N. nucleus*, F. & H. ii. p. 215, pl. xlvii. f. 7, 8, and (animal) pl. P. f. 4.

Body suboval, cream-colour, mottled with flake-white: *mantle* having a plain margin: *gills* triangular and elongated, finely striated on the outer and inner surfaces, and of a brown colour; the upper lamina of each pair is by far the larger of the two, and entirely covers the other: *lips* pendulous, and transversely striated, each of them folded inwards or doubled: *foot* oval, pale yellow, deeply serrated at the margin, and exhibiting about fifty denticles.

Shell like that of the last species in shape, but much smaller, shorter, and more tumid, as well as more triangular in consequence of the posterior side being less produced: *sculpture,* numerous fine striæ which radiate from the beak, and a few irregular lines of growth which form dark zones but do not intersect the longitudinal striæ; these striæ are wanting on the lunule and dorsal area: *colour* greyish-white under the *epidermis*, which is yellowish-green and very closely and microscopically wrinkled in a transverse direction: *margins* angular and somewhat truncate on the anterior side, curved in front, and obtusely wedge-shaped and rounded on the posterior side: *beaks* prominent but blunt, slightly recurved: *lunule* marked obliquely by the lines of growth, and strongly indented or grooved across below the beaks; it is defined by a slight furrow, and projects a little outwards, so as to form a blunt and indistinct keel: *ligament* slight: *cartilage* oval, contained in a short projecting cavity underneath the beaks: *hinge-line* somewhat curved: *hinge-plate* as in the last species: *teeth* sharply pointed and slightly recurved, about 15 on the anterior, and 25 on the posterior side: *inside* nacreous and highly iridescent, striated and notched as in *N. sulcata*, but in the present species the crenulations extend to the posterior angle: *muscular scars* oval and distinct. L. 0·475. B. 0·475.

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* A small nut.

Var. 1. *radiata*. Shell larger, flatter, more decidedly triangular and produced at the posterior side, and marked with numerous purplish-brown streaks, which radiate from the beaks outwards. L. 0·6. B. 0·6. *N. radiata*, F. & H. ii. p. 220, pl. xlvii. f. 4, 5, and xlviii. f. 7.

Var. 2. *tumidula*. Shell smaller, more triangular and convex. *N. tumidula*, Malm, Proc. Scand. Soc. (1862), p. 621.

Habitat: Common in sand and gravel on all our coasts from Shetland to the Channel Isles, at various depths ranging from 3 to 85 fathoms. Capt. Beechey dredged it off the Mull of Galloway in 145 fathoms. Var. 1. More local, but widely distributed in the British seas, as well as from the Swedish coast (Malm) to Algeria and Sicily (M'Andrew). Var. 2. Off Unst, in 85 fathoms; very rare. This variety is also Scandinavian, and was obtained by Dr. Torell in 80 fathoms. The typical form and the first variety occur in all the upper tertiaries, both in Great Britain and the south of Europe. Beyond our shores the recent species inhabits every coast from the Faroe Isles to Sicily and the Ægean, and also the North African side of the Mediterranean.

Mr. Clark says that the animal is timid, and therefore difficult to observe. When in motion, its foot becomes a flat and nearly circular disk; its progress is not direct, but, turning round as on a pivot, its path describes an irregular ellipse. M. Gay of Toulon informs me that he constantly finds empty but perfect shells, with the epidermis entire, inside starfishes, which would therefore seem to have the power of killing the animal and sucking it out of the shell, after swallowing it. Petiver called this pretty kind the "silver cockle"; and it is a favourite prize of children when they gather their sea-side harvest in the autumn,

> "On the beachèd margent of the sea."

It may be

> "The shell from the bright golden sands of the ocean,
> Which the emerald waves at your feet gladly threw,"

alluded to by Keats in his delightful sonnet to some ladies. Specimens are now and then found more convex than others, even from the same locality. Occasionally the lines of growth are raised; and where they cross the longitudinal striæ a decussated appearance is the result.

My first impression, that the *N. radiata* of Forbes and Hanley was a distinct species, has yielded to a contrary conviction, in consequence of having compared numerous specimens of all ages and sizes from various places; and I feel myself bound to reunite it with *N. nucleus.* Typical, and even ordinary specimens of each form cannot be confounded with each other; but I have some from Plymouth and Tenby, which may be referred to either form. The grounds of supposed difference are the comparative size, shape, convexity, and colouring. The first ground is evidently untenable, because size is notoriously dependent on food, shelter, and the proportionate quantity of carbonate of lime contained in sea-water, according to its proximity to the shore, or distance from it, and to the action of freshwater and marine currents. The second ground, or the degree of those angles which affect the contour of *Nucula*, is influenced by the growth of the shell in any particular direction. All the *Nuculæ* represent an isosceles triangle, the beak or point of one angle always remaining the same, while the sides or points of the other two angles extend *pari passu* by the addition of new layers in either direction. If one of these sides is more produced than the other while the angle of each is greater or less than that of the beak, a scalene triangle is the result. This is the case with *N. radiata*; and if it were a permanent or invariable character, I should regard it as having considerable weight in deciding the question. But were the most acute mathematician to measure the angles in certain specimens of the two so-called species, he would assuredly fail to detect any sensible difference. As to convexity, it is true that specimens of *N. radiata* are usually more compressed than those of *N. nucleus*. Other specimens, however, of both species are equally convex. The coloured rays are clearly a varietal, and not a specific character. They are even more conspicuous in another species (*N. nitida*), which has commonly a plain and sober hue. Instances of a similar diversity in this respect occur in *Astarte triangularis* and many other marine shells, as well as in species of the freshwater genus *Unio*. The nature and cause of colour in shells has not yet received that attention from philosophical chemists which the interest of this curious subject demands. Probably the most instructive and elaborate examination of this problem will be found in the essay of Professor Lacaze-Duthiers, entitled "Natural History of the Purple of the Ancients," to which I have referred in the Introduction to the first volume (p. lxvii), and which I shall again have occasion to notice. There seems to be no doubt that all colours are of mineral origin, and that they are secreted, by the Mollusca and other animals, from inorganic matter by special glands. But there is no necessary connexion between the colour of the mollusk and that of its shell. The plain variety of our native Cowry (*Cypræa Europæa*) is a familiar illustration of this fact. While the shell is of a uniform porcelain-white colour, its inhabitant and fabricator exhibits most varied and brilliant tints of vermilion, yellow, brown, green, and red. The coloured markings of shells cannot be relied upon as a specific test, especially when the same hue predominates; and *N. radiata* is in this respect undistinguishable from *N. nucleus*. Taking into consideration the question of locality, with reference to the remarks which I made in the Introduction to Vol. I. (pp. xix and xx), I believe it will be found that the two forms do not live together. I have never taken them in the same spot; and Forbes and M'Andrew have observed that *N. radiata* occurs at Milford Haven "always in separate parts of the bay from *nucleus*." This circumstance would of itself incline me to doubt the propriety of separating these forms unless as varieties. Sufficient weight does not seem to have been given to the remarkable occurrence in the same locality of different species of marine animals which are bisexual but require mutual impregnation *.

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* Oppian speaks of this mode of generation with abhorrence:—

Εἴτε πρὸς ἀλλήλων, τέρας ἄγριον, ἐκφύονται,
Νόσφι πόθων, καὶ νόσφι γάμων, καὶ νόσφι τόκοιο.

The difficulty arising from the sterility of hybrids among unisexual animals being thus removed, how does it happen that so many distinct but allied species assemble and live together without interbreeding or mingling their respective races? There is no fusion, there are no intermediate forms or gradations from one to another; each pursues its own course and mode of life, and appears to have no communion with its neighbour. Surely this emboldens naturalists to maintain the integrity of species as at present existing, however much they may have changed in the course of bygone ages. We take Nature as it is and apparently has been—not as it might have been; and all speculations as to the origin of species, although ingenious and interesting, are useless, for want of sufficient data to guide us in the inquiry.

The variety *tumidula* resembles *N. nitida* in shape; but the surface is not glossy as in that species, and the sculpture is the same as in *N. nucleus*.

The present species seems not to be liable to distortion; but a valve now before me from Guernsey has a fold on the posterior slope, contracting the shell, and somewhat resembling the sinuosity of *Axinus flexuosus*. Specimens from the Hebrides and the south-west of Ireland are larger than any I have seen from other parts, whether British or foreign. Besides the characters above noticed in the description of this species, it differs from *N. sulcata* in sculpture, in the beaks being more prominent, the hinge-line more curved, and the cartilage-pit shorter and broader, in having more teeth on the anterior side, and in the crenulations of the inside margin extending further towards the posterior angle.

It is the *Arca margaritacea* of Bruguière, and *Glycymeris argentea* of Da Costa. The fry is the *Nucula argentea* of Brown.

3. N. NI′TIDA*, G. B. Sowerby.

N. nitida, Sow. Conch. Ill. (*Nucula*) p. 5, f. 20; F. & H. ii. p. 218, pl. xlvii. f. 9.

BODY similar to that of *N. nucleus*; but the gills are light brown, smoother outside, and more strongly striated on the inner surface: *foot* of a paler colour, and its disk less deeply serrated at the margin.

SHELL acutely triangular, convex towards the beaks, but compressed in front, moderately solid, remarkably glossy: *sculpture* nearly the same as in *N. nucleus*; but the longitudinal striæ are slighter, and the transverse striæ are stronger, especially at the sides, giving the surface a partly cancellated or notched appearance at the points of intersection; the lunule is only marked by the lines of growth, and the dorsal area is smooth: *colour* milk-white under the *epidermis*, which is yellowish-brown, highly polished and lustrous, without any trace of the microscopical lines or wrinkles observable in the foregoing species; the latter is sometimes beautifully tinted with yellow or purplish-brown longitudinal streaks, which are arranged in irregular bundles, and resemble the rays of the setting sun: *margins* truncate on the anterior side, forming an obtuse angle where it joins the ventral range, rounded in front, and slightly produced or wedge-shaped at the posterior side: *beaks* prominent, apparently overhanging the anterior margin owing to its truncature, and recurved: *lunule* as in the last species, but deeper immediately below the beaks, and not so much raised, separated from the rest of the shell by a blunt ridge in each valve: *ligament* very slight: *cartilage* pear-shaped; cavity larger and projecting more than in the last species: *hinge-line* slightly curved: *hinge-plate* rather narrow: *teeth* long, sharp, and recurved, about twelve on the anterior, and twenty on the posterior side: *inside* highly nacreous and iridescent, conspicuously striated lengthwise, strongly notched on the ventral and anterior margins, but the crenulations do not extend to the posterior angle: *muscular scars* oval, not very distinct. L. 0·45. B. 0·45.

HABITAT: With the last, but neither so generally diffused nor so plentiful. I have taken it at low spring-tides, and at depths ranging between that mark and 86 fathoms. Glacial deposit, Paisley (Crosskey). Mörch and Walker have recorded it from Greenland, Asbjörnsen from Norway, Lovén and Malm from Sweden, M'Andrew from the Spanish coast and Algiers, and I have found it in the Gulf of Genoa. Gould says that the *N. proxima* of Say (from the Massachusetts coast) is closely allied to the present species, if not identical with it; but that shell seems to be less glossy, and the shape rather more obliquely transverse.

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* Shining.

My note of the animal differs a little from Mr. Clark's description, and is as follows:—"Colour greyish-white. Mantle finely fringed. Foot tongue-shaped, folded up when at rest; when it is expanded, it assumes a roundish-oval shape, and its margin is regularly dentate, or set with numerous point-like tentacles." The shell is usually less solid than that of *N. nucleus*; the anterior slope is more abruptly truncate, and the posterior slope more produced; the umbonal area is more convex and prominent; the beaks are more terminal; and the polished epidermis will always serve to distinguish it from its dull congener.

It is not the *Arca nitida* of Brocchi, which is a species of *Leda*. Weinkauff supposes that our shell may be the young of *N. sulcata*; but this idea is not correct, and I fear that it may tend to throw some discredit on his list of Algerian Mollusca, although it cannot be denied that he has considerably extended our knowledge of this branch of the North African fauna, and further results may be expected from his zeal and opportunities. The young of *N. sulcata*, instead of being smooth and glossy like *N. nitida*, is remarkably rough, and of a dusky hue, and it is a much broader and flatter shell.

B. Inner margin plain.

4. N. TE'NUIS*, Montagu.

Arca tenuis, Mont. Test. Brit. Suppl. p. 56, tab. 29. f. 1. *N. tenuis*, F. & H. ii. p. 223, pl. xlvii. f. 6, and (animal) pl. P. f. 5.

BODY white: *mantle* open in front and at the posterior side, with a plain edge: *foot* white, rather longer and not so decidedly pedunculated as in the other species, nor are the margins of its disk so coarsely serrated, although the crenulations are more numerous.

SHELL obtusely and obliquely triangular, and inclining to a circular form, compressed, thin, glossy: *sculpture*, only slight and irregular transverse ridges: *colour* bluish-white under the *epidermis*, which is yellowish, with a tinge of light brown, highly polished and lustrous, and destitute of microscopical or any other markings: *margins* truncate at the anterior side, and obtusely angled at the point of junction with the ventral range, rounded and broad in front, and slightly produced or wedge-shaped on the posterior side: *beaks* blunt, and scarcely prominent, not much recurved: *lunule* comparatively small but raised, defined by a slight ridge; *ligament* strong: *cartilage* pear-shaped, contained in a rather large and broad cavity: *hinge-line* curved, occupying about one-third of the circumference of the shell: *hinge-plate* forming an oblique groove on each side of the beak: *teeth* long, sharp, and nearly straight, about six on the anterior, and sixteen on the posterior side: *inside* silvery-white and iridescent, faintly striated lengthwise, with the margin somewhat thickened: *muscular scars* roundish-oval, rather distinct. L. 0·425. B. 0·45.

Var. *inflata*. Shell smaller, more triangular and tumid, with the front or ventral margin less curved: *beaks* more prominent. L. 0·3. B. 0·3. *N. inflata*, Hancock, in Ann. & Mag. Nat. Hist. xviii. p. 333, pl. v. f. 13, 14.

HABITAT: Sand and mud, in 25–100 fathoms, on the north-east coast of England, every part of Scotland from the Firth of Forth to Unst, Dublin Bay, and (according to the late Mr. Thompson) the east of Ireland. It is, however, a local species. Dr. Goodall was mistaken in giving Tenby as a locality. He collected many shells there, but procured his specimens of *N. tenuis* from the late Mr. G. B. Sowerby. It occurs in all our upper tertiaries, and especially in deposits containing shells of arctic species. The variety comes from the deepest part of Loch Fyne and the Shetland sea. It resembles *N. nitida* in shape, but is more convex. The foreign distribution of this species and its variety extends from Spitzbergen and Greenland to New England in the Western hemisphere, and from Iceland along the whole of the Scandinavian coast on our side of the Atlantic. Danielssen has taken the variety at Vadsö at from 30 to 160 fathoms. The typical form has been dredged by Sars and M'Andrew in Finmark and Upper Norway, by Örsted and Asbjörnsen in Christianiafiord, and by Malm on the coast of Bohuslän in Sweden, at various depths from 55 to 100 fathoms. Philippi has recorded it as a Calabrian fossil under the name of *N. decipiens*, being probably one of the numerous relics of the glacial epoch.

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* Thin.

Torell regards the *N. expansa* of Reeve (Belcher's Arctic Voyage, vol. ii. p. 397, pl. 33. f. 2 *a, b*) as identical with the *N. inflata* of Mörch, and perhaps also with Hancock's species; and he suggests the possibility of its being a high-northern or arctic variety of the present species. Having examined a great number of specimens of all ages collected by Dr. Torell in the arctic seas and Iceland, which he refers to Reeve's and Mörch's species, and having compared the types of Hancock's species, I have been unable to detect anything beyond a slight varietal difference between these shells and British specimens of *N. tenuis*. The arctic specimens are exactly of the same shape as the Shetland variety above described, but considerably larger.

Genus II. LE'DA *, Schumacher. Pl. IV. f. 2.

Body transversely oval: *mantle* open in front, as well as on the anterior side, and forming on the posterior side two cylindrical tubes of unequal length. Other characters as in *Nucula*.

Shell triangular-oval, or oblong: *margin* produced on the posterior side, and in some species slightly gaping or open: *lunule* lance-shaped: *ligament*, *cartilage*, and *teeth* as in *Nucula*, except that the number of teeth on the anterior side is nearly equal to that on the posterior side: *pallial scar* interrupted by the tubes.

This genus is closely allied to *Nucula* in its distribution and habits, as well as in most of the characters exhibited by the animal and shell; but the mantle in *Leda* forms two distinct tubes, and the shape of the shell is oval or oblong, instead of triangular as in *Nucula*. The teeth, also, in the present genus are set more obliquely, and the disparity of number is less between those in the front and those in the back row. It corresponds with the genus *Lembulus* of Leach, quoted by Risso; and according to Mörch ('Grönlands Blöddyr') it is Link's genus *Nuculana*, a name of prior date to that of Schumacher.

Möller's genus *Yoldia* is said to differ from *Leda* in the tubes being longer, and curved instead of straight, in the foot being larger and thicker, in the posterior edges of the mantle being ciliated instead of plain, and in the shell gaping at both ends, whereas that of *Leda* is closed at the anterior end and truncate at the other; and the posterior side has two or three blunt external ridges, and an internal rib or epiphysis caused by the separation of the tubes. But in *L. minuta* the posterior edges of the mantle are ciliated, or fringed by short filaments, and the shell of *L. pygmæa*, which is referred by northern writers to the so-called genus *Yoldia*, is closed at both ends. These (and probably *L. pernula*) being the only species indigenous to our seas, I must hesitate before admitting the proposed division of *Leda* into two genera, so far as concerns the British Mollusca.

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* A proper name in Greek mythology.

A. Shell triangularly oval, smooth and polished; posterior extremity rounded and closed: *lunule* indistinct; *teeth* set like those of a comb.

1. LEDA PYGMÆ'A *, Münster.

Nucula pygmæa, (Münster) Goldfuss, Petref. p. 157, t. cxxv. f. 17. *L. pygmæa*, F. & H. ii. p. 230, pl. xlvii. f. 10, and (animal) pl. P. f. 3.

BODY pale fawn-white colour: *tubes* short, united, with plain orifices: *foot* hatchet-shaped, and widely grooved at its posterior edge, forming when expanded a crenated disk.

SHELL nearly equilateral, sloping gradually from the beak to each side, tumid, glossy, and iridescent: *sculpture*, only a few irregular marks of growth: *colour* pearl-white under the *epidermis*, which is yellowish-brown, highly polished and lustrous: *margins* rounded at the anterior side, with an oblique slope to the ventral range, which is also rounded, somewhat produced and wedge-shaped at the posterior side, with a slight tendency to curve upwards: *beaks* small and blunt, rather incurved than recurved; *lunule* lance-shaped, but scarcely visible, and faintly defined by an obscure ridge, which runs from the beak to the posterior angle in each valve: *ligament* exceedingly slight: *cartilage* and the cavity containing it very small and short: *hinge-line* slightly curved, occupying nearly the whole of the dorsal area and considerably more than one-third of the circumference: *hinge-plate* deeply grooved, and becoming wider as the distance from the cartilage-pit increases: *teeth* rather long and sharp, placed on the inner margin of the hinge-plate, slightly curved outwards or reflected; there are 10–12 on the anterior side, and 12–14 on the other: *inside* glossy, with the margin somewhat thickened and entire: *pallial* and *muscular scars* slight, except in aged or dead specimens. L. 0·15. B. 0·2.

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* Dwarf.

Habitat: Mud and sand, in 20–86 fathoms, on the Antrim coast, Skye, Hebrides, and Shetland. It is very local in a recent state, but widely diffused in glacial beds, and occurs also in the Coralline Crag. Many conchologists have noticed it as an arctic and Scandinavian species; Danielssen and Asbjörnsen say it is found on the Norwegian coast at depths varying from 10 to 140 fathoms, and Malm on the coast of Sweden in 30–53 fathoms. The only southern habitat that I am aware of is Naples, where Scacchi is said (according to Philippi) to have taken it. It is a tertiary fossil in Siberia and Sicily.

Some specimens are shorter and more gibbous than others. Owing to the semitransparency of the shell, the teeth are distinctly visible outside the hinge-line.

Philippi named this species *Nucula tenuis*, before he was aware that Goldfuss had described it, or that Montagu had already used that name for another species. Mr. James Smith called this species *Nucula gibbosa*, and Möller *N. lenticula*. The *Yoldia abyssicola* of Torell and Sars is probably a variety of the present species. The *Y. lucida* of Lovén seems different.

B. Shell triangularly oblong, transversely ribbed, with two ridges extending obliquely from the beak in each valve to the posterior extremity, which is truncate and somewhat open: *teeth* set in a herring-bone fashion.

2. L. minu′ta*, Müller.

Arca minuta, Müll. Prodr. Zool. Dan. p. 247, no. 2985. *L. caudata*, F. & H. ii. p. 226, pl. xlvii. f. 11–13, and (animal) pl. P. f. 2.

Body oblong and pear-shaped, greyish-white: *mantle* fringed or denticulated at its posterior side by a row of five very short filaments: *tubes* united for more than half their length, considerably produced, slender and smooth; the incurrent (or branchial) tube is shorter than the excurrent (or anal) tube, and the latter has a square orifice, with finely pointed angles: *foot* oblong, compressed, white, deeply grooved, and capable of being expanded into a creeping-disk with notched margins.

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* Small.

SHELL inequilateral, sloping from the beak with an oblique curve to the posterior extremity, which somewhat resembles a duck's bill, compressed, rather solid and opaque, scarcely glossy: *sculpture*, about 30 transverse laminar ribs which vary very much in strength and compactness, besides extremely fine glittering and prismatic lines, which radiate from the beaks, but do not usually extend to the front margin unless in very young shells; and there are also two ridges, which diverge from the beak in each valve, and embrace the truncated point at the posterior angle: *colour* pearl-white under the *epidermis*, which is yellowish-brown and generally of a dull hue: *margins* rounded at the anterior side, more or less curved in front, and elongated at the posterior side to a blunt, upturned, and truncate point, where the valves slightly gape: *beaks* small, rounded, nearly straight, destitute of transverse ribs, and glossy: *lunule* lance-shaped, ribless, depressed, with slightly prominent edges or lips, and defined by the inner ridge of the posterior slope: *ligament* slight: *cartilage* oval and small, contained in an oblique pit: *hinge-line* curved on the anterior side of the dorsal area, and inflected on the other side, occupying about two-fifths of the circumference: *hinge-plate* grooved, and increasing in width in proportion to the growth of the shell: *teeth* vault-like or concave, slightly curved outwards, higher in the centre of each row, and diminishing in size towards either end; there are about 16 on the anterior side, and about 20 on the posterior side: *inside* porcellanous and glossy, somewhat thickened near the margin, which is smooth, with a distinct ridge running down the middle of the beak-like extension of the posterior side: *pallial* and *muscular scars* well marked. L. 0·3. B. 0·55.

Var. *brevirostris*. Shell smaller, longer in proportion to its breadth, with the posterior extension much shorter, more convex or tumid: ribs finer and more crowded.

HABITAT: Everywhere on our northern coasts, in muddy gravel and sand, from 20 to 90 fathoms. Captain

Beechey has dredged it alive in 145 fathoms off the Mull of Galloway. It occurs in all our upper tertiary deposits, although in all probability an allied species (*L. pernula,* Müller) has been often mistaken for it in compiling lists of fossil shells. The variety has a more southern habitat, and is found on all the English, Welsh, and Irish coasts, as well as at Oban and in the Hebrides. Both the typical form and variety frequent the Arctic and Scandinavian seas, at depths of from 10 to 160 fathoms. Gould has recorded this species from Massachusetts, and observed that he could find no difference between the American shell and a specimen of *L. minuta* from Norway, which had been sent to him by Dr. Lovén.

Specimens vary very much in convexity and the degree of striation. Those obtained from deep water are usually flatter, and more delicately grooved, while specimens from comparatively shallow water are more or less tumid, and have stronger ribs. The flat and fine-ribbed form has been taken by Dr. Torell at Spitzbergen. The fry have no ribs, but the cross lines are very conspicuous.

Lovén has not given any reason why he considers the *Arca minuta* of Montagu is not that of Fabricius, and this eminent conchologist has strangely omitted the authority of O. F. Müller for that name. Three years after the publication of his ‘Prodromus’ to the ‘Zoologia Danica,’ Müller described *L. pernula*; so that he was evidently aware of the difference between the two species. Both are found living side by side in the northern seas. *L. pernula* is the *Nucula oblonga* of Brown, which is not uncommon in the Clyde beds; and Stimpson has enumerated it among the pleistocene fossils lately collected by Mr. Drexler in Hudson's Bay. It may be identical with the *N. cuspidata* of Philippi, from the

Calabrian tertiaries. Müller's description of *Arca minuta* is in every respect applicable to our shell; and I do not see why the specific name given by him should be superseded by that of *caudata*, which Donovan long afterwards imposed on the same species. Fabricius appears to have found his original specimens of *A. minuta* in the crop of an eider duck, which may have picked up the shells on the coast of Norway before taking its return flight to Greenland. I have examined the type of Macgillivray's *Nucula rostrata*; and it is merely the compressed form of the present species, being probably the *L. intermedia* of Örsted, and analogous to the *L. complanata* of Möller. M. Weinkauff gives *Arca minuta* of Fabricius as an Algerian shell; but this appears to be a mistake, because one of the synonyms cited in his list is *Nucula striata*, Lamarck, a very different species, and an inhabitant of the Mediterranean. *A. minuta* of Brocchi (an Italian fossil) is another species, and Philippi has distinguished it, in the Supplement to his work on the Sicilian Testacea, by the name of *Nucula commutata*.

I dredged a young live specimen and a small single valve of *L. pernula*, in 80 fathoms, off the Shetland coast, in the same ground with the slender and long-beaked form of *L. minuta*. It is much more smooth and glossy than the last, proportionally longer from the beak to the front margin; and the posterior slope is flatter, and has three instead of two ridges. Not having, however, obtained a full-grown specimen, I must postpone a formal introduction of *L. pernula* into the catalogue of British shells.

The *Arca rostrata* of Montagu is a tropical shell. *Nucula arctica* of Gray (*N. truncata* of Brown, and *N. Portlandica* of Hitchcock) is a fossil of the Scotch glacial beds, but its habitation is now restricted to higher latitudes. Both of these species belong to the genus *Leda.*

Genus III. LIMOP'SIS *, Sassi. Pl. IV. f. 3.

Body longitudinally oval, or inclining to a circular shape: *mantle* open on all sides except the back: *foot* long, slender, and pointed at each end.

Shell shaped like the body, nearly equal-sided, porcellanous: *epidermis* hairy or fibrous: *beaks* incurved and diverging from each other in the course of growth: *cartilage* thick, contained in a shallow triangular cavity or depression, which is placed directly under the beaks and outside the hinge-plate: *teeth* tubercular, arranged in a continuous and curved line: *pallial scar* entire.

This remarkable, and what some would call "critical," genus is related intrinsically to *Leda,* and extrinsically to *Pectunculus.* Like the former, it has a cartilage, with a cavity for its reception; but this process is not placed, as in *Leda,* inside the shell, but on the hinge-line and between the beaks and the hinge-plate. *Pectunculus* has no cartilage; and its shell is kept closed behind by a ligament, which is wanting in *Limopsis.* The teeth are arranged in a single continuous row, as in *Pectunculus,* instead of in two separate rows in the same line, as in *Leda.* The shape of the teeth in the present genus is intermediate between that of *Ledà* and *Pectunculus,* being erect but blunt. The contour of the shell is much more like that of the last-mentioned genus, but it is somewhat longer in proportion to its breadth. *Limopsis* has scarcely any resemblance to *Lima.* Although the back of the shell in both these genera is furnished with a small wing or prolongation on the upper part of each side, and the cartilage-pit is similar, *Lima* has a differently constructed hinge-apparatus, and only one, nearly central, adductor muscle.

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* From its supposed resemblance to the genus *Lima.*

The first to point out the difference between *Limopsis* and *Pectunculus* (although he retained both in the old Linnean genus *Arca*) was the celebrated Italian palæontologist Brocchi, who, in his 'Conchiologia fossile Subapennina,' described the species which I now propose to record as indigenous to the British seas. His description and remarks are (as usual) most excellent, and he especially noticed the similarity of his *Arca aurita* to the *Ostrea lima* of Linné in respect of the triangular cavity in the hinge. The history of the present genus is involved in some obscurity, owing to the rarity of the work in which it was originally published. This was done by Sassi in the 'Giornale Ligustico di Scienze, Lettere, ed Arti' (fascicolo quinto) for September 1827. The British Museum library does not contain the work; and it is only through the kindness of Prof. Lessona of Genoa that I have been enabled to refer to it. Nyst, in his 'Catalogue of the Tertiary Fossils of Belgium' (1843), professed to be ignorant of Sassi's publication or its date, although Bronn, in his 'Lethæa Geognostica,' had given both these particulars twelve years before this statement was made by Nyst. The last-mentioned author, in conjunction with Galeotti, had in 1835 renamed this genus *Trigonocœlius*. Nyst altered the name to *Trigonocœlia*. The late Professor D'Orbigny, equally disregarding the rule of priority in scientific nomenclature, gave, in the 'Paléontologie Française' (1844), another name, that of *Pectunculina*. This has been lately adopted by Dr. Chenu in his very useful 'Manuel de Conchyliologie et de Paléontologie conchyliologique'; but he most unaccountably makes *Limopsis* and *Trigonocœlia* subgenera of *Pec-*

tunculina. Gray added a fifth name (*Limnopsis*) in 1840; and Herrmannsen, being apparently misled by Agassiz, considered *Limopsis* as a synonym of Brown's genus *Crenella.* The last two errors may be attributable, however, to *lapsus calami,* or to a too hasty attempt at classification. Only a very few species were until lately known in a recent state; but Mr. A. Adams has given, in the 'Proceedings' of the Zoological Society for November 1862, a description of no less than nine additional species from different parts of the world. Many species flourished in the tertiary, and others in the cretaceous period.

1. LIMOPSIS AURI'TA*, Brocchi.

Arca aurita, Brocchi, Conch. foss. Subap. ii. p. 485, tav. xi. f. 9.

BODY cream-colour: *mantle* thin and plain-edged, open in front and at both sides: *gills* consisting of two pairs—the outer pair being the larger, and overlapping the other which is folded together, with the edges projecting outwards: *foot* narrow and worm-shaped, when fully extended longer than the shell, bluntly pointed at each end; it is protruded from the anterior side; foot-stalk or pedicle short and broad: *byssus* filmy.

SHELL roundish-oval, with an oblique outline, compressed, solid, opaque, rather glossy: *sculpture,* numerous and fine longitudinal striæ, which radiate from the beaks to the outer margins, besides equally numerous but irregular concentric ridges, some of which are larger than the rest, and all are more or less beaded or notched by the intersection of the striæ; at the posterior side, these markings are deeper and stronger, and the surface is slightly granulated: *colour* porcelain-white: *epidermis* yellowish-brown, forming in front and at the sides a long fringe, which projects beyond the edge of the shell: *margins* rounded on all sides except at the back or hinge-area, which is sometimes straight, giving that part the appearance of having an ear-like appendage on each side: *beaks* small, sharp, and prominent, regularly incurved: *hinge-*

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* Eared.

area, or the cavity behind the beaks, narrow, striated transversely: *cartilage* small, but thick and strong, yellowish, contained in a shallow triangular pit or depression, which is placed immediately under the beaks, and lies between them and the hinge-plate: *hinge-line* nearly straight, interrupted by the cartilage-pit: *hinge-plate* very broad, occupying scarcely one-fourth of the circumference of the shell: *teeth*, about a dozen, strong, somewhat curved, and set obliquely: *inside* porcellanous and glossy, remotely and indistinctly striated lengthwise, bevelled off towards the margin, so as to form a broad and smooth edge: *pallial* and *muscular scars* very distinct. L. 0·385. B. 0·385.

HABITAT: Off Unst, the most northerly of the Shetland Isles, in 85 fathoms, sandy gravel. Altogether four living examples, a large and perfect dead one, and several single valves of different sizes have been found. Capt. Hoskyn obtained two small valves in a subfossil state from a sounding at 340 fathoms off the west coast of Ireland. It is not an uncommon shell in the Coralline Crag at Gedgrave; and Mr. Searles Wood says his cabinet contains one specimen from the Red Crag, but it is much waterworn. I have also found it in upper miocene strata in the south of France; and it has been recorded from the same formation in other parts of the Continent, as well as from the Subapennine tertiaries, where Brocchi first discovered the species. Michelotti must have been mistaken in citing it as still living in the Mediterranean.

The animal is very shy, and perhaps feels uncomfortable at being disturbed and removed from its native bed. No part of it was visible in the first specimen which I captured (in 1862), although I watched it for a long time. The shell is a lovely object when fresh and examined in water. The long and delicate but stiff hairs of its epidermis resembled a fringe of silken eyelashes surrounding the lids of a sleeping beauty; and it was exceedingly tantalizing not to see the enclosed treasure as a reward for my patience. I was more fortunate, however, in the specimens which I obtained the following year. One of them came out during the night and displayed itself. The foot was the only part visible outside. The mantle appeared to have no tube, although I saw distinctly through its open folds the gills regularly flapping. The alimentary and branchial orifice was in front. The excretal orifice was at the broader end, where fæcal pellets were occasionally ejected. The *Limopsis* extended the foot beyond the narrower end of the shell, and after attaching the extremity to the side of the glass vessel, and contracting the foot above, it drew itself up to the further point, like warping a vessel to the anchor when moored; it then again stretched out the foot, using on each occasion the whole of the elongated disk or sole, in the same manner as a *Planaria*. Repeating this operation, it contrived by slow degrees to crawl up the side, and travelled four inches in two hours, being at the rate of a mile in little less than three years and eight months. On reaching the top it spun with its foot a very fine and almost transparent but tenacious thread, the end of which it fixed to the inside rim of the vessel; and it remained for twelve hours thus suspended, with the beaks of its shell downwards. When I emptied the bottle, and put in fresh water, the byssal thread still continued fixed, and the *Limopsis* kept its former place. It only loosed its hold after having a slight degree of force used. In this respect the strength and duration of the attachment differed from that by which *Sphærium lacustre* or *Kellia suborbicularis* suspends itself. The process, however, is the same in all cases, whether it be the occasional secretion by the last-mentioned bivalves of a slight gossamer filament or the production by a *Pinna* of the comparatively stout cords or cables by which it is permanently anchored to the sea-bottom. Most of the Conchifera appear to be byssiferous.

A species of *Limopsis* closely allied to the present has been taken by Mr. M'Andrew on the coast of Upper Norway, in from 70 to 100 fathoms, and was referred by him to the *Pectunculus pygmæus* of Philippi. Sars found the same species also on the Norwegian coast, but considered it to be the *P. minutus* of Philippi. Both species are fossil. The *L. pygmæa* of Searles Wood from our Coralline Crag is certainly different from Mr. M'Andrew's shell. In Adams's 'Genera of Recent Mollusca' the Norwegian species is called "*L. borealis*, Woodward." The inside margin of the shells found by M'Andrew and Sars is notched or crenulated, but in *L. aurita* it is plain or entire, and the contour of this last shell is rather less oblique. Whether the crenulated margin is a specific character in *Limopsis* may be open to doubt. Of two species of *Astarte* (*A. sulcata* and *A. triangularis*) usually having notched edges, a variety of each is not uncommon which has smooth edges; and specimens are occasionally found possessing both characters, or having the inner margin partly notched.

Genus IV. PECTUN'CULUS *, Lamarck.

Pl. IV. f. 4.

Body nearly circular, or suborbicular: *mantle* open in front, as well as on the anterior side, and sometimes folded on the posterior side into a very short excretal duct; the other part of the mantle on the posterior side has its margin furnished with numerous ocelli or eye-like points: *foot* large and thick, shaped when at rest like an axe, but capable when in motion of being expanded into a discoidal form.

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* A small scallop (Pliny).

SHELL suborbicular, convex, nearly equal-sided, porcellanous: *epidermis* velvety: beaks slightly incurved, and becoming separated from each other in the course of growth. *ligament* altogether external, very strong, occupying a vaulted cavity at the back of the shell, composed of several bundles of cylindrical fibres, which radiate from the beak to the hinge-plate, to the outer edge of which they are united: *teeth* laminar and continuous, arranged in a curved line but in two distinct rows: *pallial scar* entire: *muscular scars* oval, symmetrical, and strongly marked.

The rounded form of *Pectunculus* prevents its being mistaken for any other genus of the same family, except *Limopsis*; and the substitution of a compound ligament for a simple cartilage, besides other specialties of the hinge-structure, offer sufficient marks by which these genera can be known one from the other. Moreover *Pectunculus* has never been observed to produce a byssus: but I do not consider this a distinguishing characteristic. The nature of their habitation is the same.

The present genus has descended in an unbroken line from the Silurian epoch to the present time. The extent of its distribution in space is equally great. It is prolific in species; but only one of them has yet been found as far north as the Loffoden Isles. This is the kind that inhabits our seas.

Lister was the first naturalist, since Pliny, to use the word *Pectunculus*; but he applied it to most bivalve shells. His second division of *Pectunculi* had a frightfully long adjective—*Polyleptoginglymi*—and comprised *Arca* and *Pectunculus*. Eight years before Lamarck published the present genus, Poli proposed the name *Axinæa* for the animal. This last name has been adopted by Oken and Gray; but as it was founded solely on anatomical, and therefore insufficient characters, it does not seem expedient to substitute it for the long-established name given by Lamarck.

1. PECTUNCULUS GLYCY'MERIS *, Linné.

Arca glycymeris, Linn. Syst. Nat. p. 1143. *P. glycimeris*, F. & H. ii. p. 245, pl. xlvi. f. 4–7, and (animal) pl. P. f. 6.

BODY nearly round and compressed, yellowish-brown: *mantle* thick, covered with minute specks of brown and flake-white; it is quite open on the anterior side, and but slightly contracted on the other side: the edges on the posterior side are studded with numerous, small, black, eye-like tubercles: *foot* very large, axe-shaped, deeply cloven or folded lengthwise when not in action.

SHELL slightly compressed, very thick and solid, of a dull hue: *sculpture*, numerous fine longitudinal striæ, and more remote impressed lines, which are crossed by transverse or concentric striæ, varying in number and strength, the surface being thus often reticulated: *colour* yellowish-white, irregularly mottled with zigzag streaks or blotches of purplish brown, or marked with spots or longitudinal lines of the same colour, sometimes of a beautiful pink or lighter tint, and even milk-white: *epidermis* brown and thick, forming rows of short bristles on the impressed lines in young specimens: *margins* rounded on all sides except at the back, where they are interrupted by the beak and hinge-line: *beaks* small and prominent, incurved: *ligament* dark brown, consisting of eight or nine bundles, which are placed in a large triangular and grooved cavity below the beak; these bundles are consequently longer at each end, the shortest being in the middle: *hinge-line* semicircular: *hinge-plate* also curved, extremely broad and thick, occupying two-sevenths of the circumference: *teeth* set obliquely, six or seven in the adult (besides a few others of a smaller size) on the anterior side, and nearly as many on the posterior side, the intermediate space being smooth; in younger shells the number of primary teeth is the same, but the middle area is furnished with four or five minute teeth: *inside* yellowish, with a purple tinge in some parts, freckled or closely pit-marked, bevelled towards the margin, which is broad and strongly notched at the edge: *muscular scars* very conspicuous. L. 2·25. B. 2·25.

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* A name given by Pliny to a kind of shell-fish.

Habitat: Sandy and shelly gravel and nullipore on every part of our coast from the Shetland to the Channel Isles, in 7–90 fathoms. It is gregarious, as well as generally diffused; and it occurs in all our upper tertiaries. Sars has recorded it from the Loffoden Isles, and Lilljeborg from Christiansund; and it ranges southward on the east to the Ægean, and on the west to Madeira and the Canaries. Brocchi and Philippi have enumerated it as fossil in the Subapennine and Sicilian tertiaries.

This is the "Dog-cockle" of Da Costa. The animal is sluggish and shy. I never saw it crawling. Mr. Clark observes that "the animal does not execute a direct progressive locomotion, but only turns the shell round on its disk or from side to side." The great thickness of its shell does not effectually protect this succulent mollusk from all its enemies. I was informed by Dr. Lukis that the dredge often brought up large empty shells, with the valves united, but having pieces broken off. This has been probably the work of the cat-fish, whose enormously strong jaws and teeth nothing but a solid stone can resist. Mr. Cleghorn attributed the imperfect state of all boulder-clay shells to this cause; but with respect to *Cyprina Islandica*, which is the most common shell in such deposits, I will in the proper place suggest another explanation. Specimens of *P. glycymeris* vary considerably in the degree of convexity, as well as in the obliquity of their outline, and in colouring. The typical or usual form is more produced at the posterior side, especially in the adult state; the variety *pilosa* is more orbicular; in the variety *decussata* the longitudinal striæ are deeper, but less numerous; and small, round coloured spots distinguish the pretty variety *nummaria*. The largest specimens I possess are about three inches in diameter. The fry have a square shape, and are only sculptured by concentric striæ. Their inside margin is quite plain, and has no appearance of the crenulations which are developed in a subsequent stage of growth. The impressions left by the ligament on the triangular space between the beaks in full-grown shells are very distinct. I do not find that the remarkable structure of the ligament, which is evident from these impressions, has ever been noticed. The hinge-process is liable to become abnormal or monstrous. A curious instance of it was exhibited in a specimen found by Mr. Barlee in the Shetlands. The hinge-plate had none of the ordinary cardinal teeth; but, by way of substitute, each valve was provided with a rather strong laminar and horizontal tooth on each side, which locked into a corresponding groove in the opposite valve. The teeth occasionally decay and become carious in living specimens. Whether the animal suffers from tooth-ache would be a novel subject for discussion by the Odontological Society. Aged individuals are often almost toothless, in consequence of the ligament pushing so far forward on the hinge-plate, as to obliterate all the central teeth: it reminds one of the hardened gums of an old man who has lost the greater part of this extremely useful apparatus. The shells are often seen in grotto-work; and Mr. M'Andrew says that at Algarve on the coast of Spain they are used, instead of lead, by the fishermen for sinking their lines. The anterior side of the shell, while the animal is alive, is frequently fringed with the tubes of a Hydroid polype (one of the *Tubulariidæ*), which seems to take advantage of the strong gyratory current produced by the mollusk for its own food-seeking purpose. This may be an analogous case to the supposed parasitic nature of *Montacuta substriata*, which is always found attached to the ventral spines of certain Echinoderms. Living specimens of *P. glycymeris,* which I have dredged in 85 fathoms, had their shells beautifully marked by variegated streaks of a bright reddish-brown.

Mr. Searles Wood has taken a great deal of pains in making out the synonymy of this variable species in a recent and fossil state. He cites no less than eighteen different names. Among the best-known of these are *Arca pilosa* (Linné), *A. bimaculata* (Poli), *Pectunculus stellatus* (Lamarck), *P. undatus, decussatus,* and *nummarius* (Turton, but not Linné's species of *Arca* bearing these names), and *P. lineatus* (Philippi). The *Arca minima* of Turton's 'Conchological Dictionary' was admitted by him, in his 'Dithyra,' to be the fry of this species, although Leach subsequently referred it to *A. Noæ.* Mr. Hanley at first asserted that, from an examination of Linné's own specimens, his *A. glycymeris* was the *P. "violascens"* (*violascescens*) of Lamarck; but he afterwards corrected the mistake. The first locality given by Linné (on the authority of Lister) for *A. glycymeris* was "Garnsey," where *P. violascescens* has never been found. The last-named species appears to be his *A. nummaria,* judging from the description in the 'Systema Naturæ.'

Genus V. ARCA*, Linné. Pl. IV. f. 5.

Body oblong and thick: *mantle* entirely open, except at the back, in some species fringed with tentacular filaments, or furnished (as in *Pectunculus*) with ocelli: *foot* large and extensile: *byssus* composed of glutinous threads, which sometimes form a compact mass, or plug of attachment.

Shell oblong or rhomboidal, gibbous, inequilateral, and in a few species slightly inequivalve: *epidermis* fibrous: *ligament* as in the last genus; but the bundles are not in all cases placed diagonally, being in some species across the space between the beaks: *hinge-line* straight: *teeth* laminar, and set at or a little more or less than a right angle to the hinge-line, continuous in most species, but divided into two distinct rows in others: *pallial scar* entire: *muscular scars* oblong, symmetrical and strongly marked.

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* A chest; or from the supposed resemblance of Noah's ark to this shell.

Arca rivals *Pectunculus* in its high descent, as well as in its fertility; and it far excels it in the number of species. It has, besides, a wider distribution, one species (*A. pectunculoides*) being found both on the coast of Greenland and in the Ægean. Its bathymetrical range is considerable, extending from low-water mark to between 300 and 400 fathoms. Unlike *Pectunculus*, it spins a byssus, and is by this means attached to submarine substances, from which it can disengage itself at pleasure; or it takes permanent shelter and makes its abode in the cranny of a rock, the shell occasionally becoming distorted by the narrow limits of its habitation.

The generic name is encumbered by a load of no less than thirty synonyms, which have been from time to time imposed by the fanciful ambition of systematists, or for the more laudable purpose of distinguishing particular groups of species. It will probably always remain a question whether subgenera are advisable, the settlement of it depending in a great measure on the definition of a genus. The characters of all genera cannot be equivalent; or perhaps we have not yet found the right key to Nature's lock. All are agreed as to the existence of varieties; and they must be discriminated by certain names, in the same way as species, genera, and higher groups. One of Linné's botanical axioms may be cited in support of this method of identification:—"Nomina si nescis, perit et cognitio rerum." Whether subgenera stand in the same relation to genera as varieties to species, is the point at issue. I am not in favour of this intermediate sort of classification, and believe it would lead to unnecessary confusion, and to a redundancy of names for the same object. "*Arca* (subg. *Cucullæa*) *pectunculoides*" is not easy to pronounce, or even to remember, on account of the parenthetical epithet. Such a mode of subgeneric nomenclature appears to me quite opposed to the spirit and simplicity of the binomial system; and it may not be desirable to follow the example of some modern painters in reviving a state of things that has passed away and become obsolete, by now having a pre-Linnean school. The animal of *Arca* constituted the genus *Daphne* of Poli.

A. Shell slightly inequivalve: *teeth* few in number, set either obliquely or in the line of the hinge-plate, and arranged in two rows, one at each end of the plate, besides numerous crenulations in the middle across the plate.

1. ARCA PECTUNCULOḮDES*, Scacchi.

A. pectunculoides, Scacchi, Ann. civ. d. due Sicil. vi. p. 82. *A. raridentata*, F. & H. ii. p. 241, pl. xlv. f. 8.

BODY reddish-brown: *foot* long and narrow, when in motion resembling that of a Gasteropod: *byssus* rather long, horny, and consisting of a single cylindrical thread.

SHELL obliquely rhomboidal, describing in its contour a segment equal to nearly two-thirds of a circle, tumid, thin, rather glossy; the right valve (or that which has the anterior side to the right hand of the observer) is unmistakeably smaller than the left valve, the margin of which slightly projects and encloses the opposite valve: *sculpture*, numerous fine and sharp longitudinal ribs, radiating from the beaks, and equally numerous but less raised transverse or concentric ribs, which cross the other striæ and give the surface a regularly reticulated aspect: *colour* yellowish-white, faintly tinged with brown: *epidermis* laminar, thicker towards the margins, and when fresh forming a line of short hairs on each of the longitudinal striæ: *margins* rounded on all sides except the dorsal or hinge-line; anterior margin only half the depth of the posterior one; ventral margin slightly indented by the byssal chink: *beaks* not widely separated, small but prominent and a little recurved: *ligament* reddish-brown, slight and never perfect, composed of numerous fine threads, which cross the depressed and narrow area at the back, and leave their impress in the shape of minute striæ: *hinge-line* quite straight, and forming almost a right angle at each end, occupying nearly the whole breadth of the shell: *hinge-plate* narrow in the middle and widening towards each end, so as to afford a broad angular space for the reception of the teeth on either side: *teeth* 3 or 4 on the anterior side, and 4 or 5 on the posterior side, indistinctly and irregularly notched on their outer edges, set more or less obliquely and sometimes nearly parallel with the hinge-line; besides these teeth, and on that part of the hinge-plate which lies between the two rows, is a series of minute crenulations (like the ordinary teeth in *A. lactea* and allied species), which cross the hinge-plate and lie nearly at a right angle with the side teeth: *inside* porcellanous and somewhat nacreous, obscurely marked by remote longitudinal striæ; margin often indistinctly notched, especially at the sides: *pallial scar* slightly flexuous: *muscular scars* very large and conspicuous. L. 0·175. B. 0·2.

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* Like *Pectunculus*.

HABITAT: The Hebrides and Shetland Isles, from 35 to 90 fathoms, in muddy and sandy gravel. Mr. M'Andrew has dredged it off Cape Clear in 60 fathoms, and Capt. Hoskyn off the west coast of Ireland in 100 fathoms. It is an abundant fossil in the Coralline Crag at Sutton. According to Scacchi and Philippi it likewise occurs in the upper tertiaries of the south of Italy; and Nyst has recorded it from a similar formation in Belgium. In the Arctic seas it attains a remarkably large size. Dr. Wallich took, at a depth of 108 fathoms, on the east coast of Greenland, a specimen whose dimensions nearly equal those of *A. glacialis*. Specimens obtained by Sars and M'Andrew on the coast of Finmark at depths of from 20 to 160 fathoms are smaller than the Greenland shells; but those from our own seas and more southern latitudes dwindle into insignificant proportions compared with any of the above. M'Andrew has also dredged this species alive off Gibraltar, in 45 fathoms, and Forbes in the Ægean, in 200 fathoms. Two specimens which I procured from deep water off the north coast of Shetland were attached by the byssus to tubes of *Pomatoceros arietinus,* Müller (*Ditrupa subulata,* Berkeley); and I kept one of them alive for more than a day. Soon after it was put into a glass vessel and had a fresh supply of water, it left its plug of attachment on the Annelid case, and crawled away at a fair pace on its narrow foot, the valves of its shell spread out with the beaks uppermost. The action appeared to be similar to that of *Galeomma Turtoni.*

The shell has all the characteristics of Lamarck's genus *Cucullæa,* the side teeth being nearly parallel with the hinge-line, and consequently at almost a right angle to the central teeth or crenulations. But this angle varies in different individuals and at successive periods of growth, and the position of the side teeth is more frequently oblique than horizontal. The central teeth are often wanting. I therefore abstain from removing this species from *Arca,* as well as from offering any opinion as to the value of Lamarck's genus. Mr. G. B. Sowerby was the first to notice the inequality of the valves in *Cucullæa.*

Dr. Torell called my attention to the probability that the present species might be identical with the *A. glacialis* of Gray. Professor Sars had previously expressed the same opinion; and in his Report on the so-called glacial formation in the Diocese of Christiania, he referred to the latter species as "*A. raridentata*, var. *major*." Having carefully inspected and compared a great number of specimens, recent and fossil, reputed to belong to both species, and having had the advantage of examining on the spot the grounds upon which Sars formed his opinion, I am not satisfied that these species ought to be united. At first sight, indeed, it might seem as if *A. glacialis* were only a large form of *A. pectunculoides*, and that the difference of size was explained by the former having a more northern habitat. But since *A. pectunculoides* has been found in Greenland, and *A. glacialis* is not uncommon in Iceland, while each constantly exhibits its own distinctive features, and attains nearly an equal size in the Arctic seas, we must inquire whether there is any intermediate link or variety connecting the two forms. I believe this question must be answered in the negative, so far as our present knowledge extends. The shell of *A. pectunculoides* is roundish-oval or trapezoidal; that of *A. glacialis* is obliquely oblong. The former is more gibbous or convex than the latter; the length, or distance from the umbo to the front margin, is proportionally greater; the beaks are more prominent and placed nearer the centre of the hinge-line; the posterior margin is rounded, instead of wedge-shaped (as in *A. glacialis*); the sculpture is much finer, and the striæ more numerous, even in specimens of a corresponding age and size; and the teeth are fewer and set less diagonally than in the other species. The only description which has been published of the animal of *A. glacialis* is contained in Dr. Gray's Supplement to the Appendix to Parry's First Voyage, and is as follows:—"Animal: mantle lobes separate; foot flat, compressed, subquadrate, front two cut with one or two fibres from the lower edge; trachea none." For want of sufficient information on this point, it is at present impossible to make a complete comparison between the so-called species. All the fossil specimens which I have seen from the Christiania and Uddevalla districts belong to *A. glacialis,* and they significantly indicate the climatal conditions which prevailed during the period immediately preceding the elevation of these sea-beds. *A. pectunculoides,* being found in the Coralline Crag, as well as in the upper tertiaries of Belgium and Sicily, would appear to be the older of the two. Although I am not aware of any intervening form having been discovered, such may have existed; and supposing that to be the case, it would be fair to infer that *A. pectunculoides* was the ancestor of *A. glacialis.* Naturalists have been so much accustomed to regard species in an objective point of view, and not as abstract ideas, that it is difficult to bring their minds into the proper frame of thought for discussing speculative theories upon confessedly so difficult a question as the origin of species.

The present species is the *A. raridentata* of Searles Wood, who has recognized, in his work on the Crag Mollusca, the priority of Scacchi's publication, and adopted the name which I have now given; and it appears to be also the *A. pusilla* of Nyst.

B. Shell equivalve: *teeth* numerous and uniform, set across the hinge-plate, and either divided into two rows or arranged in a single and continuous row.

2. A. OBLI′QUA*, Philippi.

A. obliqua, Phil. Faun. Moll. Sic. ii. p. 43, t. xv. f. 2.

SHELL obliquely oval, with a rhomboidal outline, much narrower at the anterior side, and spreading out on the other side, compressed in the middle and indistinctly furrowed by a longitudinal groove, which runs from the beak to the front margin, convex, rather solid, scarcely glossy: *sculpture,* numerous fine and rounded ribs, radiating from the umbo, and equally numerous but laminar transverse striæ which are raised or imbricated over the longitudinal ribs—a reticulated appearance resulting from their crossing each other: *colour* milk-white: *epidermis* thin and silky: *margins* rounded on all sides except behind, with a slight inflection in front, sloping abruptly on the anterior side, and wedge-shaped on the posterior side; dorsal angle well developed: *beaks* small, blunt, and glossy, placed near the anterior margin and close to the hinge-line: *ligament* yellowish, slight, and narrow: *hinge-line* nearly straight, occupying three-fourths of the shell's breadth, gently curved: *teeth* arranged in two rows, that on the anterior side consisting of 4 or 5, and the other of 10 or 12, set nearly at a right angle to the hinge-line, but slightly diverging as they approach each end; the intermediate space is smooth: *inside* porcellanous, marked with a few longitudinal striæ, which only extend to the pallial scar; margin thickened and broad, with the edges faintly crenulated: *muscular scars* very large and conspicuous. L. 0·15. B. 0·2.

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* Oblique.

HABITAT: 80–85 fathoms, off Unst, in shell-sand. Two valves only (right and left) have been found, one by myself and the other by Mr. Waller; both are fresh and perfect. It is a Scandinavian species, and has been taken by Danielssen in 60–80 fathoms at Vadsö, by Sars in West Finmark, and by Malm in 100 fathoms on the Bohuslän coast. It was discovered by Philippi in newer tertiary strata at Lamato in Calabria; and Mr. M'Andrew has shown me two recent valves which he received from the late Professor Forbes, probably Ægean.

This interesting addition to the British mollusca is intermediate between *A. pectunculoides* and *A. lactea.* From the former it differs in being shorter in proportion to its breadth (the shape also being more oblique), and in having the beaks placed much nearer to the anterior side, and from the latter in its smaller size and coarser sculpture, and in having only half the number of teeth. The longitudinal furrow or indentation in the middle is also a peculiar character of the present species. Norwegian specimens are twice the size of ours, and these last are larger than Forbes's specimens.

It is the *A. Korenii* of Danielssen ('Beretning om en Zoologisk Reise,' 1859) and *A. lactea* of Malm. The *A. obliqua* of Reeve is a West-African shell, and a very different species.

3. A. LAC'TEA *, Linné.

A. lactea, Linn. Syst. Nat. p. 1141; F. & H. ii. p. 238, pl. xlvi. f. 1–3.

Body white: *mantle* having its border finely notched, and pale-red towards the middle of the dorsal area; the under surface of the ventral line is marked with irregular flake-brown blotches on a pale-yellow ground, and the upper surface is marked for some little depth with a sand-like rusty-brown belt and a darker interrupted line nearer the margin: *gills* symmetrical and equal in size, very thin and gradually tapering, pale yellow: *foot* extensile, fleshy, and pure white: *byssus* short, horny, composed of several leaf-like threads.

Shell varying in shape from rhomboidal to triangular, tumid, solid, of a dull hue: *sculpture*, numerous and fine longitudinal ribs, which become fewer and stronger at the sides, besides slighter and rather more numerous transverse ribs, which cross the other, making the front surface appear reticulated, and forming rows of minute tubercles at the point of intersection; sometimes a few smaller and intermediate longitudinal ribs are perceptible in front: *colour* yellowish-white: *epidermis* brown, laminar and downy, thicker and forming towards the front and sides longer threads, which occasionally resemble short bristles: *margins* rounded at the anterior side, straight or nearly so in front, obtusely wedge-shaped and somewhat truncate on the posterior side, with a blunt keel or ridge separating that side from the rest of the shell, and which is very distinct and sharp on the umbonal area: *byssal sinus* sometimes distinctly visible in front: *beaks* small, not very prominent, blunt and slightly recurved: *ligament* thin, and resembling that of *A. pectunculoides* in every respect, except that in the present species it is of a lozenge shape, corresponding with that of the ligamental cavity, which is deep; the number of cords is between 40 and 50: *hinge-line* quite straight, and forming an obtuse angle at each end, occupying about two-thirds of the entire breadth of the shell: *hinge-plate* as in the last species: *teeth* about 35, small and straight in the centre of the hinge, becoming larger and diverging obliquely and gradually towards each side, so as to form a gently curved row; each tooth is finely striate on both sides: *inside* porcellanous, marked lengthwise with remote striæ to within a short distance from the margin, which is usually quite smooth and plain, although occasionally the left valve is slightly crenulated, especially on the posterior side: *pallial scar* entire: *muscular scars* very large and well defined, of a quadrangular shape. L. 0·45. B. 0·65.

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* Milk-white.

HABITAT: Gravel, from 15 to 25 fathoms, on the English, Welsh, and Irish coasts, from Berwick Bay to Jersey, and also at Oban (Bedford), where it becomes rare. It is fossil in the Red and Coralline Crag, as well as in the Subapennine and Sicilian tertiaries. M'Andrew has taken it at low water in Algarve, and Forbes at from 10 to 150 fathoms in the Ægean; it is common in the Mediterranean, and ranges to the Canary Isles; but it does not appear to have been found north of the British Isles.

Lister first noticed this species as English; and Dr. Pulteney called it the "hairy ark-shell." Mr. Clark has remarked that the foot is very like that of *Galeomma Turtoni*, showing the connexion between the latter and the present genus, in respect both of the animal and the shell. *A. lactea* is usually fixed by its byssus to the inside of old bivalve shells, or (in the south of Devon) wedged in crevices of loose fragments of New Red sandstone. The latter circumstance induced Turton at one time to suppose that the animal excavated rocks; and he gave this shell the specific name of *perforans*, believing that it was not the *A. lactea* of Linné. The shell varies considerably in the proportion of its different parts, as well as in the comparative tenuity of sculpture. It never grows to much greater dimensions than I have stated in the description. My largest specimen, which was evidently a veteran, and must have outlived most of its generation, is not much more than three-quarters of an inch in length.

I should have been inclined to consider the present species the *A. modiolus* of Linné, if it were not for the expression that it is exactly the shape of *Mytilus modiolus* and the size of a large bean. The rest of his description agrees with it in every particular. He even placed *A. modiolus* in one section as having a plain margin, and *A. lactea* in another as having a notched margin. He says both inhabit the Mediterranean, and that *A. lactea* is "*diaphana*," which is certainly not the case in our shell. In all probability his *A. lactea* is the *A. imbricata* of Poli, a thinner shell and having the inside margin strongly notched. Brocchi applied Müller's name of *nodulosa* to the present species, because *A. lactea* was described by Linné as possessing the last-mentioned character; and for the same reason Poli, Olivi, Chierighini, and Costa adopted the name of *A. modiolus*. But I will not venture to expunge the generally received name of *lactea*, and to substitute for it another which is referred by many conchologists to a common West-Indian shell—especially as so much obscurity still involves several of the Linnean species, notwithstanding the laborious research devoted to the subject by Mr. Hanley. What we call *A. lactea* may be the *A. barbata* of Müller's 'Prodromus,' although certainly not that of Linné. Pennant made the same mistake. It has had many other names, including *Mytilus Garnseiæ* (Petiver), *A. crinita* (Pulteney), *A. Gaimardii* and *A. Quoyii* (Payraudeau), *A. striata* (Reeve), and *A. Pennantiana* (Leach).

I found a small single valve of *A. nodulosa*, Müller, in some dredged sand from Shetland. This species inhabits the Swedish and Norwegian coasts, and occurs at depths varying from 15 to 150 fathoms. The shell is broader or more produced at each end, and thinner than that of *A. lactea*; the sculpture consists of several longitudinal rows of vaulted or imbricated scales instead of cross ribs; and the teeth are not half so many as in the other species, and they are placed more obliquely or diagonally. It is closely allied to *A. imbricata*, but in that species the inside margin is notched. *A. aspera*, Philippi, from the Sicilian tertiaries, appears to be the same as Müller's species.

4. A. TETRAGO'NA*, Poli.

A. tetragona, Poli, Test. Sic. ii. p. 137, t. 25. f. 12, 13; F. & H. ii. p. 234, pl. xlv. f. 9, 10, and (animal) pl. P. f. 1.

BODY white: *mantle* having its border plain, but the upper half of it on the posterior side is fringed with about 40 close-set and equidistant ocelli or dark dots, which vanish or are indistinct towards the anterior side; the margin is also mottled, both above and below, with flakes of pale yellow: *gills* nearly coequal in size, and striated, of a brown colour: *lips* expanded, formed out of the extremities of the gills: *foot* white and subconical, tapering to a blunt point, and furnished with a deep byssal groove: *byssus* dark-green, composed of a few leaf-like plates.

SHELL forming an irregular parallelopipedon, and angular, sometimes twisted on the posterior side, very tumid, solid, of a dull hue: *sculpture*, the same as in the last species: *colour* yellowish, irregularly mottled with reddish-brown: *epidermis* light brown, filamentous, and forming rows of short leaf-like bristles in the interstices of the longitudinal ribs, becoming thicker towards the front and at the sides: *margins* rounded on the anterior side, which is very short, flexuous in front, wedge-shaped and pointed at the posterior side, where a sharp keel runs obliquely from the beak to an acute angle at the extremity of the posterior slope: *byssal sinus* long and wide: *beaks* small, slightly recurved, and widely separate from each other owing to the extent of the ligamental area: *ligament* thin, of a golden-brown tint, lozenge-shaped and composed of several strips or bands placed diagonally; ligamental cavity very large and deep, usually smooth, but occasionally striated by the impression of the ligament: *hinge-line* straight, forming nearly a right angle at each extremity, its length equalling the entire breadth of the shell: *hinge-plate* broad and strong, considerably wider at the posterior extremity: *teeth* 40–50, arched, perpendicularly striated on both sides and having their crests consequently notched; those on the posterior side are the longest, and many of them are double: *inside* porcellanous, partly stained with reddish-brown and green blotches; margin slightly crenulated, especially on the anterior side: *pallial scars* flexuous: *muscular scars* oval, very large and conspicuous. L. 0·85. B. 1·5.

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* Quadrangular.

HABITAT: Rocky, stony, and shelly ground on all our coasts and at all depths. In Bantry Bay it is not uncommon at low water, closely wedged in the chinks of slate-rocks, the shape being distorted and the surface scraped in consequence of the confined position. The abrasion is perhaps caused by the uneasiness of the animal, through its continual endeavours to extricate itself or change its place. In deeper water (20–90 fathoms) it occupies the crevices of large stones and the hinge-cavities of old bivalve shells. In all cases it is firmly attached by its byssus, and not a slight degree of force will suffice to dislodge it. It is a Red and Coralline Crag fossil. The foreign distribution of this species extends from Finmark to the Ægean Sea on the east, and to the Azores and Canaries on the west. Asbjörnsen has dredged it on the coast of Norway in 10–20 fathoms, and Malm on the coast of Sweden in 80–100 fathoms. M'Andrew has taken it alive on the Spanish shore; and Forbes has recorded its range of depth in the Ægean as 30–80 fathoms.

The valves of this curious shell are so deep, that Lister mistook them for sessile Barnacles, and called them *Balanus Bellonii*. The animal is very shy and sensitive. According to Mr. Clark a glutinous fluid appears to exude from a special gland to supply the byssus, which is moulded by the foot. Capt. Brown says the shell "burrows in hard clay and limestone rocks"; but this does not accord with my observation of its habits.

In all probability this is the Norwegian shell mentioned by Linné, in his 'Systema Naturæ,' as like *A. tortuosa* but of much smaller size. That species inhabits the Indian Ocean. Müller applied the above name, in his 'Prodromus,' to what appears to be the present species, and Pennant did the same in his 'British Zoology.' Lamarck called it *A. cardissa*. Montagu and subsequent writers on British conchology considered it was the *A. fusca* of Solander's MS., although Bruguière's species of that name is different. Turton, in his 'Conchological Dictionary,' mistook it for *A. Noæ* of Linné, a well-known Mediterranean shell, which has never been authenticated as a native of the British seas. Philippi and Lovén adopted Bruguière's name, *navicularis*; but that species is stated to inhabit the coast of St. Domingo, and is very unlike our shell. Mr. Reeve has added another name (*Britannica*) to this long list. Weinkauff has, on the other hand, proposed a reduction of the catalogue, by uniting the present species with *A. Noæ*. He says that he has found specimens at

Algiers showing the transition of one of these species from the other.

The accentuation of the name *tetragona* has also perplexed many conchologists. There is no question that, if it were formed into a Latinized-English word, the accent would lie on the second syllable, as is the case in pentagonal and hexagonal, and Dr. Latham was quite right in saying that English quantities are not Latin quantities. But *tetragona* being a Latin word, it seems to me that the classical mode of accentuating words written in that language, according to their correct or accustomed quantity, ought to be used in pronouncing such names as the present. This name being derived from *γωνία* "an angle," and having been adopted by the Romans, as well as the Greek combination of the same root with other numerals, the penultimate syllable is long, and I have therefore placed the accentuating mark over it.

I have now before me the original specimen of Turton's *A. reticulata,* which he said was found in Lough Strangford by his son-in-law, Dr. Macgee. It is not the *A. reticulata* of Gmelin, but the *A. barbata* of Linné, and is a rather common Mediterranean shell. Mr. Dillwyn gave me two single valves, in a much worn state, received by him from Miss Hutchins, as having been collected by her in Bantry Bay, and which he sent to Montagu for his inspection. The paper in which they were wrapped still bears the name "A. barbata" in the handwriting of the latter naturalist. I do not consider this evidence sufficient to include the species among our indigenous mollusca. Collard des Cherres, however, has enumerated it in his list of shells living on the coast of Brittany, and it may therefore be looked for in the Channel Isles.

The Turtonian collection also contains a specimen of

A. imbricata, or an allied species from the West Indies, enclosing the dried remains of the animal, and marked in his handwriting "*Arca rostrata*, Plymouth." Mr. Leckenby found a dead specimen and an odd valve of the same species in a mass of *Filograna complexa*, which was brought to him by a fisherman from the Dogger bank. I merely notice the occurrence of these shells with a view to further inquiry.

Family VII. GALEOM'MIDÆ, Gray.

Body oval, compressed, thick and fleshy: *mantle* closed, except in front for the passage of the foot, and at each end, where a tube is formed for alimentary and excretal purposes; it has two lobes, one of which is folded externally over the shell, and the other is internal, and has its margin fringed with cirri or filaments and is studded with ocelli: *gills* two on each side: *foot* large and flexible: *byssus* strong.

Shell oblong, equivalve, nearly equilateral, pearly and reticulated, gaping widely in front: *cartilage* internal: *hinge* toothless.

This curious and anomalous family consists of only one genus and one species, so far as concerns the British mollusca; and neither the family nor that genus is well represented abroad. It is related to the last family through *Arca*, and to the next family (*Kelliidæ*) through *Lepton*; but it cannot be placed in either, consistently with the ordinary principles of classification. The animal of *Galeomma* has ocelli, like some species of *Arca*; and the shell of each has a straight hinge-line, and a large opening on the opposite side—for the passage of the foot in the one case, and of the byssus in the other. But the shell of *Galeomma* is covered by a fold of the mantle, instead of by an epidermis, and for the external ligament of *Arca* is substituted an internal cartilage;

and, moreover, it wants the characteristic feature of the last-mentioned genus, viz. the numerous cardinal teeth: the hinge of *Galeomma* has no tooth of any kind. Its habit of active locomotion, the structure of its shell, and its internal cartilage connect it with *Lepton*; but in that genus the shell is capable of being completely closed, and it is furnished with both cardinal and lateral teeth. Forbes and Hanley united the present family with *Kelliidæ*; and Clark placed it, as well as the genus *Lepton*, in the *Arca* family. Gray proposed to make one family of *Galeomma*, and another of *Lepton*; but the latter does not form an isolated or aberrant group, like the former; and if every genus is to be raised to the rank of a family, the organization of natural history may be compared to an army consisting of officers only.

The members of this family, although by no means numerous, are widely distributed over the globe, except towards the north pole. Our single European species does not seem to have travelled to a higher latitude than the southern coasts of Great Britain.

Genus GALEOM'MA*, Turton. Pl. IV. f. 6.

Characters described above, as belonging to the family.

The singular shell which represents this genus in the European fauna was discovered by Dr. Turton nearly forty years ago; and its no less remarkable animal was first noticed by Scacchi, a Neapolitan conchologist. In 1834 Quoy and Gaimard published an account of another species, which they referred provisionally to *Psammobia*, and which constitutes one of the numerous additions to science made in the course of their celebrated voyage in the 'Astrolabe.' France, Russia, Austria, and even the comparatively poor kingdom of Sweden, as well as the United States, have excelled us in such enterprises; and all that our own wealthy nation has undertaken in this way of late years has been more owing to a spirit of commercial enterprise than to a desire of promoting philosophical knowledge. Surely some of our numerous smaller ships of war and their hardy crews might be advantageously employed in scientific expeditions to various parts of the world, instead of the vessels rotting in harbour, and our seamen becoming discontented by an irksome and monotonous routine of discipline. The stale question of *cui bono* might be easily answered by pointing to such men as Sabine, Fitzroy, Darwin, Joseph Hooker, Busk, Huxley, Jukes and others, who were formerly educated in similar voyages of research. The influence of their works on the mind and character of the people has been eminently and notoriously beneficial; and we should all have deep cause for regret, were this race of great masters to become extinct and be superseded by a class of political economists who could only teach us where cotton might be best obtained, or what effect a gold instead of a paper currency may have on the material prosperity of the next generation. No thinking person will deny that science ought to be an important branch of national education. If any part of the public money is to be so applied, teachers of natural history must be instructed—not as at present by skimming books of doubtful authority and superficial information, but by a course of sound and practical lessons, such as would be acquired by means of voyages of discovery. The notion that science can take care of itself, and that its votaries can provide their own amusement, is only another form of the dangerous maxim *laissez faire*. The great masses are like children, and ought to be educated as well as protected; and if proper tuition is not afforded, their minds may be occupied with other and less innocent thoughts, and deplorable consequences may result to their short-sighted governors from a want of timely precaution. As Montaigne aptly says, "l'âme descharge ses passions sur les objets faux quand les vrais luy defaillent."

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* Cat's eye.

Let us, however, return from politics to *Galeomma*.

Its nearest ally is *Arca*. Both have the same shape, the ventral gape is similar, the hinge-line is nearly as straight, and the mantle is equally furnished with ocelli. But here the analogical resemblance ends. The animal of *Arca* has no tube, and the shell is of a different texture. That of the present genus has an internal cartilage instead of an external ligament, and it entirely wants the peculiar teeth of the *Arca* family. Mr. Clark must have been mistaken in supposing he saw "oblique, though nearly obsolete teeth on the ligamental line in *Galeomma Turtoni*." Owing to the thinness and transparency of its shell, the oblique striæ which ornament the external surface are indistinctly perceptible through the hinge-plate of its outer edge; and I believe this appearance may have misled my usually most accurate friend: I have carefully and closely examined, with different powers of a first-rate microscope, the hinge-apparatus of many fresh specimens, and never could detect the slightest vestige of any tooth. In the 'Proceedings' of the Zoological Society for 1855 is contained an excellent paper by M. Deshayes on this genus. He has there described no less than twelve new species, in addition to *G. Turtoni* and (provisionally) the *Psammobia vitrea* of Quoy. Eleven of these new species, however, are said to be provided with teeth; so that either the generic character in that respect requires alteration, or the species in question may belong to *Lepton* or an allied genus.

The *Galeommata* inhabit rocky ground, and are found at various depths, from low-water mark to the coralline zone. An account of their habits, so far as they are known, will be given presently, among other particulars of our unique species.

GALEOMMA TURTO'NI*, Editors of the 'Zoological Journal.'

G. Turtoni, Turton in Zool. Journ. ii. p. 361, tab. xiii. f. 1; F. & H. ii. p. 105, pl. xxxv. f. 11, and (animal) pl. O. f. 5.

BODY pure white: *mantle* partly closed in front, with an opening for the foot, of a thin texture, except at the edge, which is muscular and forms a tumid cord extending beyond the shell; from this cord is thrown off a double wavy margin, one flake of which is stretched like an extremely thin skin and covers the shell, and the other or inner margin is marked with equidistant frosty-white tubercles or ocelli, 8 or 9 on each side, with fine white intermediate filaments: *incurrent tube* at the anterior side, wide, irregularly sinuous, and not always present: *excurrent tube* at the posterior side, small, with a plain orifice: *gills* of equal size: *lips* 2 on each side, more coarsely pectinated than the gills, of which they apparently form a continuation: *foot* worm-like, cylindrically tapering to a point; the byssal groove is at its heel, close to the body.

SHELL transversely oblong, much compressed towards each end, thin, opaque except when held up to the light, of a glistening aspect: *sculpture*, numerous and delicate ribs, which radiate from the beak to the margins, curling round towards the back or hinge-area, and branching off (especially in front) at irregular intervals; these ribs are crossed by still more numerous and fine transverse or concentric striæ, and by their intersection the angles are slightly nodulous: *colour* snow-white: *epidermis* not visible and apparently replaced by the pallial membrane: *margins* obliquely truncate and wedge-shaped at the anterior side, the end of which is rounded, gently curved in front for the entire breadth of the shell, with an extremely long and wide ventral gape, more decidedly truncate and somewhat longer at the posterior side, which is also wedge-shaped and has a rounded end: *beaks* slightly prominent, and appearing like small nipples, placed nearer the anterior side: *hinge-line* nearly straight, occupying more than half the breadth of the shell: *cartilage* oval, yellowish-brown, lying close to the beaks on the posterior side: *hinge-plate* incurved, somewhat thickened, terminating on the anterior side in an obtuse angle, and merging in the slope on the other side: *inside* pearl-white and glossy, with the edges finely crenulated by the projection of the longitudinal ribs, and slightly grooved on each side below the hinge-plate: *muscular scars* oval. L. 0·2. B. 0·4.

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* Named in honour of Dr. Turton, the well-known author of several works on British Conchology.

Habitat: Rocky and stony ground, from low-water mark to 20 fathoms, on some of our southern shores; but it is very local. It is not uncommon in the little island of Herm, where it was probably discovered by Dr. Turton; single valves are not unfrequently dredged off Guernsey; Mr. Clark obtained it alive in the same way off Exmouth; and Mr. W. Thompson has taken it in *Eschara foliacea*, thrown up on the beach at Weymouth after a storm. The single valve mentioned by Turton in his original description, on the authority of Dr. Goodall, was formerly in the collection of Mr. George Humphreys, and is said to have come from Ireland. It is now in my cabinet. Cailliaud has found it on the coast of Brittany, D'Orbigny at Noirmoutiers in La Vendée, M'Andrew in Vigo Bay; and several others have noticed it as inhabiting the Mediterranean, from the Gulf of Lyons to Sicily, as well as the Adriatic. The only occurrence of it in a fossil state was observed by me at Biot near Antibes, where I found a single valve in a raised beach, at the distance of about a league from the sea, with other shells belonging to species that are still living in that part of the Mediterranean.

Mr. Clark informed me that he gave his dredger, Branscombe, a guinea for the first specimen taken at Exmouth. Branscombe's account was that he captured the same day a second specimen, and laid it on one of the thwarts of his boat, until the jar which contained its intended companion in captivity could be got ready, but that in the mean time the free specimen crawled away and escaped overboard. This is like Mr. Stutchbury's story of the once rare *Trigonia pectinata*, several specimens of which he unaccountably lost, before he was aware of its habit of taking a long leap, and he wrongly accused his dredger of secreting them. As, however, it was not Branscombe's interest to keep back any shell from his liberal employer, who paid him much better than any one else, the disappearance of the *Galeomma* in the mode above related seems very probable. Scacchi, Philippi, Deshayes, Mittré, and Clark have severally described the animal. The last-named author says, "A fasciculus of fine filaments issues from the byssal fissure in the foot, which fix the animal so firmly to whatever it is placed on, as to require some force to disturb it; in fact the byssus is discarded, by being altogether withdrawn from a slit in the foot, whenever an attempt is made to remove the animal by force; but though we repeated the operation several times, the little creature did not appear to be injured or less lively, but, as soon as it had crawled to some distance, we had the good fortune to witness the formation of a new byssus, which was effected by the discharge of a light-green gelatinous opake matter from the fissure at the heel of the foot, which by its ponderosity resolved itself into delicate fibrous filaments that instantly adhered to the saucer: we detached the animal several times; the byssus was always left, and a new one formed. On leaving it for the night, in a marked position, we found in the morning that it had detached itself by abandoning the byssus, and had formed another at a considerable distance. The animal marches with great rapidity, by flatting the valves into the form of a circular disk; it then, by the foot, aided by the muscular margins of the mantle, makes rapid progression. It marched across the saucer before ten could scarcely be counted." Mr. Alder noticed a peculiar expansion of the mantle, which invests the shell like a membrane. Philippi had previously remarked that this membrane resembles the true skin of vertebrate animals; but Alder has given a further explanation of its structure. He says "it is a continuation of the true skin, and consists of two layers; the lower of which is slightly muscular, and under the microscope the muscles may be seen interlacing each other in all directions. The outer layer is granular, and is covered with tubercles, which possibly, when the animal is alive, may rise into papillæ. The want of an epidermis appears to be thus supplied." The interesting particulars above given of its organization make us anxious to know more about this wonderful mollusk; and it is to be hoped that the investigation will be continued by Mr. Alder, or prosecuted by some other observant naturalist. The animal is hardy, and could be safely sent by post, packed in *Chondrus crispus* or some stiff sea-weed, to any place within reach of the sea. The number, position, and nature of the siphonal tubes have not yet been satisfactorily made out. Philippi describes one only, Mittré two (besides an anomalous organ resembling the large tentacle of *Lepton squamosum*), while

Clark does not mention any. Nor do we know what it feeds on. According to Mittré it lives on the roots and leaves of fuci; but at Herm these sea-weeds are not found in the spots frequented by the *Galeomma*. He observes that they look like beautiful pearls, when seen beneath the water at a depth of from three to four fathoms. Mr. Dennis remarks, in a note with which he has kindly favoured me, "How surprisingly tough the animal of *Galeomma Turtoni* is—quite like a limpet! They occurred at Herm in little colonies, invariably where a large loose piece of granite rested against the solid rock, and never under stones which lay flat." The shell resembles that of *Lima* in its composition and structure. Mr. Norman's cabinet contains a specimen having a longitudinal fold in the middle of the front margin, and resembling in that respect a monstrosity of *Pisidium fontinale*, which I noticed in page 26 of the first volume of the present work.

This species is the *Hiatella Poliana* of Costa, *H. striata* of Delle Chiaje, and *Parthenope formosa* of Scacchi. Nardo states that it is the *Tellina aperta* of Renier.

Family VIII. KELLI'IDÆ, (*Kelliadæ*) Forbes and Hanley.

Body oval or suborbicular, gelatinous: *mantle* open in front, as well as in most genera on the posterior side to form an excretal tube; it has only a single lobe, the margin of which is fringed with cirri: *gills* 2 on each side: *foot* long and extensile: *byssus* slight.

Shell triangular, oval, oblong or subglobose, equivalve, more or less inequilateral, thin, variously sculptured, completely closed: *epidermis* slight: *beaks* calyciform: *cartilage* internal: *hinge* furnished with cardinal or lateral teeth, or with both.

All the *Kelliidæ* are of small size. They are also upstarts in a conchological point of view, none having been known to Linné, or described by any writer until near the close of the first decade of the present century. But the family came into this country long before the Conqueror. Many of our recent species flourished in the time of the Coralline Crag; and the history of their existence in these dark and remote ages has been duly chronicled. They now inhabit both hemispheres: one kind of *Montacuta* is found in the Arctic seas, and species of that and other genera are diffused over all the vast tract of sea which lies between Cape Horn and

> "The gulfy coast of Norway ironbound."

A peculiarity of this family consists in some of them being viviparous. This is certainly the case with *Montacuta substriata*, *Lasæa rubra*, and *Kellia suborbicularis*. The *Sphæriidæ* resemble these members of the present family in the above-mentioned peculiarity, as well as in shape.

Genus I. LEPTON *, Turton. Pl. IV. f. 7.

Body voluminous: *mantle* protruded, and furnished with long tentacular cirri: *foot* capable of being expanded into a disk-like form.

Shell roundish-oval or triangular: *cartilage* small: *hinge* furnished with a single cardinal tooth and two strong lateral teeth in each valve.

This genus closely resembles *Galeomma*; but the animal has no ocelli, the shell does not gape in front, and the hinge exhibits a goodly array of cardinal and lateral teeth. Mr. Clark has, by his careful observations, completely dispelled the commonly received idea that the shell gapes. It can be completely closed on all sides at the will of the animal. A species (*L. loripes*), half an inch long, found on the coast of Florida has a singular habitat. According to Mr. Stimpson, the discoverer, " it lives in sand or mud, on the flats, near low-water mark, at the depth of a foot below the surface, and generally occupies the holes of marine worms and fossorial crustacea." This might warrant a supposition that the animal of *Lepton* is predacious.

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* Thin as a scale.

Three species of *Lepton* are enumerated in Dr. Philip Carpenter's list of mollusca from the west coast of North America. The genus *Scintilla* of Deshayes appears to be closely allied to the present genus.

A. Shell pit-marked.

1. Lepton squamo'sum *, Montagu.

Solen squamosus, Mont. Test. Brit. i. p. 565. *L. squamosum*, F. & H. ii. p. 98, pl. xxxvi. f. 8, 9, and (animal) pl. O. f. 6.

Body clear white: *mantle* very large, having its margins flexuous and often puckered into two or three folds; the margins extend considerably beyond the shell, and from them springs, on each side of the ventral range in the middle, a row of 25 rather long, slender and pointed milk-white tentacular filaments; the pallial margin has also at its sides 40 long, strong, close-set, blunt, frosty-white cirri of different lengths, one of these last filaments being much larger and longer than the others, and resembling one of the tentacles of a Gasteropod: *excurrent tube* short: *foot* bluish-white, and transparent, with a broad streak of intense snow-white running down the middle, and a still more conspicuous flake at the anterior end; it is fixed to the centre of the body by a moderately long pedicle. (Clark.)

Shell roundish-oval, with a tendency to a square outline in consequence of the front margin being nearly straight and of the hinge-line being unusually broad; it is very much compressed and almost flat, thin, semitransparent and glossy: *sculpture*, numerous and minute circular pit-marks, which are caused by the intersection of a close network of fine longitudinal and transverse ribs, the former radiating from the beaks and curved towards the back and sides; there are also distinct lines of growth, which vary in their distance from each other: *colour* snow-white: *epidermis* exceedingly thin, and only shown by an iridescent hue in young specimens: *margins* obliquely truncate on both sides, with the angles rounded, somewhat incurved in front, and slightly curved outwards at the back: *beaks* small, somewhat prominent, placed a little nearer to the anterior than to the posterior side: *hinge-line* gently curved, occupying nearly one-third of the circumference of the shell: *cartilage* triangular, yellowish-brown, close to the beaks on the posterior side: *hinge-plate* broad, incurved, excavated in the middle for the reception of the cartilage: *teeth*, one small and slight but upright cardinal, lying directly under the beak and close to the cartilage, and a long laminar lateral on each side of the cavity containing the cartilage; the lateral teeth are placed at a little distance within the hinge-line: *inside* iridescent, striated lengthwise but irregularly; margin plain: *pallial and muscular scars* usually indistinct, owing to the thin texture of the shell. L. 0·575. B. 0·45.

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* Scaly.

HABITAT: Shelly gravel and sand, in 8–20 fathoms, on the coasts of Cornwall, Devon, and Dorset, as well as at Guernsey, and in the south and west of Ireland. It is recorded in the 'British Mollusca' as having been found by Lyons and Hanley at Tenby, by M'Andrew at Anglesea, and by Barlee at Oban; but another locality there given on my authority ("off Skye") must have originated in a mistake. Searles Wood found a single specimen in the Coralline Crag at Sutton. Its foreign range appears to be limited or little noticed. Lilljeborg has taken it at Christiansund in Norway, Malm and Lovén on the coast of Bohuslän in Sweden (the former in 12–20 fathoms), I found it at Etretat in Normandy, Cailliaud in the Département of Loire-inférieure, and M'Andrew dredged it at 8 fathoms in Vigo Bay. It may be decidedly considered a local species.

This curious shell was discovered by Montagu, and described by him from a single valve. Although quite aware that it did not belong to any of the Linnean genera, he was much more averse than naturalists of the present day to travel out of the beaten path, and he therefore provisionally placed it in *Solen.* Its shape is not very dissimilar from that of a *Solenicurtus.* Its nearest comparison, however, would be to a fish-scale; and its sculpture is equally beautiful, and resembles the finest lace laid out on cambric. The pit-marks which cover the surface of the shell are like those which ladies so often see on the top of their thimbles, but without admiring or noticing the ornamentation, their thoughts perhaps being occupied with something else. The refraction of light through the punctures makes the silver-white shell appear under a microscope to be studded with glittering dew-drops. Nor is the animal less curious or lovely than the shell. Two excellent observers, Alder and Clark, have published some interesting details of its peculiarities and habits. Mr. Alder says that the single filament noticed in my description is waved to and fro like a tentacle when the animal is crawling, and apparently enables it to feel its way as it goes. The other filaments are comparatively motionless, floating loosely in the water, though capable of being thrown out or withdrawn at pleasure. The edges of its large foot can be either closed or expanded so as to form a disk, as in *Nucula.* As may be imagined from the size of the foot, the *Lepton* crawls about very freely; and sometimes it swims in an inverted position on the under surface of the water, in the manner of some Gasteropods, the hinder part of the foot being then unfolded and disk-shape; but its favourite posture is that of repose, suspended perpendicularly, with the beaks of its shell downward, by three or four threads, which are so fine that they cannot be seen by the naked eye; and even by the aid of a magnifier they can only be observed when the light falls upon them at certain angles. When the animal withdraws into its shell, the latter can be completely closed; but usually the valves are kept a little open, and the mantle protruded beyond them. Mr. Clark kept a specimen alive for thirty-four days in a glass of sea-water, changed daily, and it was seemingly as vigorous all that time as when first placed in captivity. He states that when it was in motion and had made a step, the long tentacular filament curled inwards, like the fore-finger of an open hand bent down to the palm, but immediately afterwards it resumed a straight position to await another step; all the other filaments were either retractile or contractile, separately or together. The foot can form a disk at each end. According to his account, a glutinous red filamentous matter is copiously poured out by the byssal gland. But I would venture to surmise that this phenomenon may be connected with the reproductive functions. Mr. Clark goes on to say, "The animal is vivacious, and allowed itself to be examined many times daily; it marched with quickness, but I only once saw it progressing in a vertical position; the usual posture of the shell is to rest on one of the disks, which is frequently changed for the other; the adductors did not appear to allow of a greater opening of the valves than the ordinary extent. The animal, when placed at the bottom of a glass, always crawled up and moored itself by a filament at the side; sometimes, however, it slipped its moorings and floated free on the surface of the water with the umbones downwards, and after an interval refixed itself by spinning a byssal thread." He subsequently succeeded in obtaining another lively specimen, which, he adds, "on being placed in water, at once unfurled its long and beautiful fringes, and exserted the ample niveous mantle and foot. This is certainly the prince of British bivalves; the snow-white colour of both animal and shell sheds over this interesting creature the inexpressible charms of purity and elegance." I can fully sympathize with the enthusiasm of my old friend, although I have not been equally fortunate in seeing the paragon he has so well described. But I hope some of my readers will endeavour to realize the truth of his description by their own experience; and it will be more satisfactory, for, as our best of poets says,

> "Beauty itself does of itself persuade
> The eyes of men without an orator."

Dr. Leach has named this species *Eupoleme cancellata.*

2. L. NI'TIDUM *, Turton.

L. nitidum, Turt. Conch. Dith. p. 63. *Kellia nitida*, F. & H. ii. p. 92, pl. xxxvi. f. 3, 4, and (*L. nitidum*) App. iv. p. 255.

BODY clear white and gelatinous: *mantle* having its edges protruded beyond the shell as far in proportion as in *L. squamosum*; it is closely fringed with cirrous filaments, which are more developed in front than behind, each of them being studded at the point with four or five white cilia, so sharp and minute as to require a high power to see them, and that only in certain lights: *tube* formed by a fold or projection of the mantle at the anterior end, being contrary to the position of this organ in the last species: *foot* pale azure, marked with intense, but irregular flake-white minute blotches; each end from the pedicle or stalk is of equal length and finely pointed. (Clark.)

SHELL subrhomboid-oval, somewhat compressed, not very thin, semitransparent, and glossy: *sculpture*, a few minute pit-marks near the beaks, which are only perceptible by the aid of a high magnifying power, besides faint and irregular concentric striæ which traverse the whole surface, and are visible with an ordinary lens: *colour* varying from pale yellowish to clear white: *epidermis* slight, but brilliant and prismatic: *margins* rounded at each end, much broader at the side furthest from the beak, very slightly curved in front, and somewhat angular at the back: *beaks* prominent and projecting beyond the dorsal margin, placed nearly in the middle, but a little towards the narrower end of the shell: *hinge-line* curved, occupying about one-fourth of the circumference: *cartilage* small and slight, light horncolour, placed close to the beaks on the narrower or posterior side: *hinge-plate* narrow, incurved or excavated in the middle: *teeth* as in *L. squamosum*, but they are more developed and lie more compactly, the cardinals are more oblique, and the laterals are smaller, and placed nearer the hinge-line in consequence of the groove which contains these teeth being narrower and deeper in proportion to the size of the shell: *inside* highly iridescent, and microscopically striated lengthwise; margin plain: *scars* distinct. L. 0·1. B. 0·125.

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* Shining.

Var. 1. *convexa*. Shell rather more convex, and coarsely pit-marked throughout. *L. convexum*, Alder, Cat. Moll. North. & Durh. p. 93; F. & H. ii. p. 102, pl. xxxvi. f. 10.

Var. 2. *lineolata*. Shell rather flatter than usual, and marked with minute longitudinal lines.

Var. 3. *pisidialis*. Shell triangular and convex, resembling in shape *Pisidium pusillum* (var. *obtusalis*), marked with exceedingly minute wavy ribs, which are formed by the confluence of the pit-marks.

Habitat: Gravelly sand on most parts of our coast from the Shetland to the Channel Isles, in from 10 to 90 fathoms: although local, it is not uncommon. It is a Coralline Crag fossil. Var. 1. Equally diffused in a recent state. Var. 2. Loch Fyne (M'Nab); Exmouth (Clark); Guernsey (J. G. J.). Var. 3. Torbay (Webster). The typical form has been found by Malm on the Swedish coast in 20–50 fathoms, and by myself in the Gulf of Spezzia in 18 fathoms. Sars has noticed its occurrence in postglacial beds in the Christiania district.

According to Mr. Clark the anterior part of the animal occupies the broader side of the shell, contrary to what is the usual rule in bivalves and even in this genus, taking *L. squamosum* as the type. His remark seems to be confirmed by the position of the cartilage in the present species being different from that in *L. squamosum.* The characteristic sculpture of *L. nitidum* is extremely variable, but never absent. In apparently the smoothest and most glossy specimens the pit-marks may always be discerned near the beaks *oculo bene armato.* In all probability Dr. Turton had not used a microscope when he described the shell to be without punctures. From this state to that of the variety *convexa* the gradations of sculpture are almost endless. The pit-marks usually are circular, but sometimes they are oval, elliptical, or polygonal, and occasionally they are confluent and form undulating wrinkles towards the front margin. Not unfrequently one half only, or a greater or less portion, of the surface is thus marked, the other part being quite smooth. Perhaps the most elegant kind of ornamentation is that which combines the impressions exhibited by the first variety with the radiating lines of the second. The shell may readily be distinguished from the young of the last species by being much less compressed and comparatively more solid, by its beaks and hinge-line being more prominent, and the teeth infinitely stronger and more compact. Mr. Clark says that it is a far more active creature than *L. squamosum,* creeping up a glass as easily as a Gasteropod; the shell is generally carried on one side, with the foot in the same position, but is sometimes held upright when the animal is on the march. This little gelatinous mollusk, enclosed in its pellucid valves,

> "A liquid prisoner, pent in walls of glass,"

and having the borders of its cloak fringed with tufted hairs, which are so delicate as to be almost invisible, is not less worthy of admiration than its larger and more showy congener.

B. Shell concentrically grooved, or marked with fine longitudinal lines.

3. L. SULCA'TULUM *, Jeffreys.

L. sulcatulum, Jeffr. in Ann. Nat. Hist. 3rd ser. Jan. 1859, p. 34, pl. 2. f. 2 *a–g*.

BODY of a light yellowish-brown colour.

SHELL nearly circular, the contour being interrupted only by the prominence of the beaks, somewhat compressed, thin, semitransparent and glossy: *sculpture*, broad, numerous and regular concentric ribs, which are equally strong and distinct throughout the surface, and still more numerous and fine longitudinal lines, which are not perceptible by the naked eye: *colour* clear white: *epidermis* filmy: *margins* rounded at the sides and in front, with a gentle fall from the beak to each end: *beaks* projecting a little beyond the dorsal margin, slightly inclined towards the narrower and shorter side: *hinge-line* obtusely triangular, occupying scarcely one-fourth of the circumference: *cartilage* small, placed close to the beak on the shorter side: *hinge-plate* broad and thick, not much excavated for the reception of the cartilage: *teeth*, one strong and erect cardinal in the left valve, and a much smaller one in the right valve, besides a remarkably strong and triangular lateral on each side of the beak in both valves; that on the broader side is longer than the other; the grooves into which these lateral teeth lock are correspondingly deep: *inside* nacreous and glossy, with a plain margin: *scars* rather distinct. L. 0·055. B. 0·06.

HABITAT: Rather plentiful among corallines in the laminarian zone at Guernsey. I also found it at Etretat on the coast of Normandy, as well as among some small shells from Sardinia which I received from M. Hupé for examination; and I noticed specimens in

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* Slightly furrowed.

Mr. M'Andrew's collection, dredged by him off Orotava and Lancerote in the Canary Isles.

This is certainly not the young of any other shell, as might be hastily imagined on account of its minute size. I have a series of all ages from the fry to the adult. Nor does it resemble any other British shell. In some respects it is even abnormal as a *Lepton.* The regular concentric ribs and the inclination of the beaks to one side do not occur in any of the above-described species. The dentition, too, is peculiar. The cardinal tooth in the left valve is united by a ledge with the lateral tooth on the longer and broader side of the shell, so as to make both appear in one point of view like the same tooth. The cardinal tooth in the other valve is not discernible unless in fresh specimens, and by means of a Coddington lens or an equally strong microscopical power. Even this pigmy shell, barely exceeding half a line in length, is sometimes found to have been drilled by one of the smaller *Muricidæ.*

4. L. CLAR'KIÆ *, Clark.

L. Clarkiæ, Clark, in Ann. Nat. Hist. 2nd ser. March 1852; F. & H. iv. p. 255, pl. cxxxii. f. 7.

SHELL triangularly oval, with an oblique outline, much compressed, not very thin, semitransparent and rather glossy: *sculpture*, slight and numerous but irregular concentric striæ, which are stronger and more crowded in front and at the sides, and usually a few snow-white lines or streaks, radiating from the beak towards the margins and more or less interrupted; the surface is also slightly scabrous or rough in fresh specimens: *colour* yellowish-white: *epidermis* extremely thin: *margins* abruptly truncate but rounded at the smaller end, with an oblique slope to the ventral margin, which is likewise rounded, very broad, and wedge-like at the larger end, and forms a blunt angle behind: *beaks* small, projecting beyond the dorsal margin, placed considerably nearer to the posterior or narrower side, which is not half the size or breadth of the anterior side: *hinge-line* obtusely triangular, occupying about one-third of the circumference: *cartilage* rather large, situate close to the beaks on the narrower side: *hinge-plate* rather narrow but thick, deeply excavated in the middle: *teeth*, in the left valve a strong and oblique cardinal, and a long laminar pointed lateral on each side of the beak; in the right valve a very minute cardinal, with strong lateral teeth as in the other valve; all the laterals are nearly of equal size, and diverge a little inwards from the hinge-line: *inside* nacreous and glossy, with a plain margin: *scars* not very distinct. L. 0·085. B. 0·1.

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* Named out of compliment to Mrs. Clark, the wife of the distinguished British conchologist.

Habitat: Gravelly sand, at depths of from 18 to 80 fathoms, on various parts of our coast, but not everywhere. The localities being few, I will enumerate them. Shetland, Arran Isle, co. Galway, Fowey (Barlee); Exmouth (Clark); Plymouth (Rouse); Skye, Barmouth, Lulworth, Torbay, Guernsey (J. G. J.). Although this appears at present to be rather a scarce species, it is hoped that something will be sooner or later known of its distribution in other parts of the European seas, as well as of the animal. The probabilities are much against any of the marine invertebrata being exclusively confined to the line of soundings round our own sea-girt coasts.

The shell differs from that of any of its congeners in the obliquely rounded outline, and especially in the sculpture, which consists of fine and irregular concentric striæ, instead of pit-marks or regular transverse and parallel ribs. It is also marked with longitudinally radiating lines, and the beaks are much nearer one end. The structure of the hinge agrees better with that of *L. sulcatulum*.

Genus II. MONTACU'TA *, Turton. Pl. V. f. 1.

Body oval, rather thick: *mantle* protruded, and fringed with short cirri: *excurrent tube* sessile: *foot* large, tongue-shaped.

Shell triangularly oval or oblong: *cartilage* proportionally large, placed underneath the beak on the smaller and narrower or posterior side: *hinge* furnished with two strong lateral teeth in each valve.

Montagu preeminently deserves to have his name commemorated in the present genus, because all the known British species were discovered and admirably described by him. Two out of the three are dwellers in mud: the other has a singular habitat, being invariably found attached to the spines on the under side of *Spatangus purpureus* and other Echinoderms of the same kind.

The founder of this genus, Turton, says that the hinge is furnished with cardinal teeth but with no lateral ones. This appears to be a mistake; at least I consider the scheme of dentition to be exactly the reverse of the above. The entire space under the beak in the hinge of each valve is occupied by the cartilage; and this is the only place where cardinal teeth must be looked for. The teeth in all the British species of *Montacuta* are long and laminar, one on each side of the cardinal area, and diverging obliquely inwards. A deep cavity or indentation is thus formed in the hinge, resembling the letter V reversed, and enclosing the cartilage. The sides of this letter represent the usual shape and position of lateral teeth. Cardinal or hinge teeth lie immediately under the beak, and are either tubercular or short. The cartilage is in some species calcified at its point of attachment, and in consequence of its composition not being homogeneous, the base becomes hardened to such an extent, that a cup-shaped process or "ossicle" is formed, which can be separated from the shell. It can only be detected in fresh specimens before the cartilage has dried up; and the latter is seldom preserved, owing to its elastic nature and slight attachment to the pit, which is fixed and forms part of the shell. The genus *Thracia* has nearly the same kind of process.

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* Dedicated to the memory of Colonel Montagu, one of our best zoologists.

Gould was of opinion that the present genus and *Kellia* ought to be united, or else that the one might merge in *Ungulina* of Daudin, and the other in *Erycina* of Lamarck. Nyst referred *Montacuta* to the last-mentioned genus. But although Lamarck states that the ligament in *Erycina* is internal, the hinge is described as having cardinal as well as lateral teeth. The structure of the hinge in *Ungulina* is very different from that in *Kellia*.

Several species are noticed by Dr. Philip Carpenter as inhabiting the Gulf of California.

1. MONTACUTA SUBSTRIA'TA *, Montagu.

Ligula substriata, Mont. Test. Brit. Suppl. p. 25. *M. substriata*, F. & H. ii. p. 77, pl. xviii. f. 8, 8 A, and (animal) pl. O. f. 2.

BODY whitish and nearly transparent: *mantle* having its margin simple, and largely open in front for the passage of the foot: *gills* large and conspicuous: *foot* muscular, transparent, very much longer than the shell, issuing from the broader end, tapering to a disk-like point, and furnished at the heel with a byssal groove.

SHELL varying in shape from a long to a short oval, with an oblique outline, rather convex, not very thin, semitransparent, usually of a dull aspect, but sometimes glossy: *sculpture*, about a dozen very slight and indistinct ribs, which radiate from the beak but do not quite extend to the front margin; there are also a few white longitudinal streaks, and concentric lines of growth: *colour* yellowish-white: *epidermis* extremely thin: *margins* abruptly truncate but rounded at the smaller or posterior end, with an oblique slope to the ventral margin, which is also curved and rather deeply indented for the byssus, very broad, wedge-shaped, and rounded at the anterior end, and forming an obtuse angle behind: *beaks* small, blunt, and nearly straight, protruded beyond the dorsal margin; they are placed very much nearer to the posterior side, which is not one-fourth the size of the other: *hinge-line* slightly curved, occupying about one-fifth of the circumference: *cartilage* yellowish-brown and semicylindrical, clasping the hinge-line on the posterior side of the beaks: *hinge-plate* short and narrow, but strong, not deeply excavated in the middle: *teeth* triangular and pointed, that on the anterior side in each valve being longer and rather larger than the other; the teeth in one valve lock into sockets in the other, but not in the corresponding valve of every specimen—it apparently being indifferent whether the right or left valve contains the more prominent teeth or the sockets: *inside* nacreous and glossy, with a plain margin: *pallial and muscular scars* indistinct, the former being more perceptible than the latter. L. 0·115. B. 0·125.

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* Slightly striated.

Var. *lævis*. Shell smooth and destitute of the radiating striæ.

HABITAT: On the ventral spines of *Spatangus purpureus*, and occasionally of *Amphidetus ovatus* (*A. roseus*, Forbes), in sandy ground, at depths ranging from 8 to 90 fathoms, on every part of our coasts. Capt. Beechey took it alive on the *Spatangus* in 110–140 fathoms off the Mull of Galloway. The variety is from deep water in Shetland. It is a Coralline Crag species. Lovén, Sars, Asbjörnsen, M'Andrew, and Malm have recorded it as inhabiting the Scandinavian seas from Finmark southwards, Petit as found in the north of France, and Récluz, Vérany, and Macé as Mediterranean. The last-named conchologist informs me that it occurs in the Gulf of Lyons on *Cidaris hystrix*. Sars mentions that at Naples it attaches itself to *Spatangus meridionalis*; and Malm says that on the coast of Bohuslän not only *S. purpureus* and *A. ovatus*, but also *Brissus lyrifer*, are favoured with its company. An ally, if not a variety, of the present species of *Montacuta* was described by Récluz in the 'Revue de Zoologie' for 1844 under the name of *Erycina seminulum,* and stated to have been discovered by M. Caron in the Mediterranean on the spines of different kinds of sea-urchins, principally *Echinus esculentus.* I mention these cases to show that it is not confined to *S. purpureus,* or the "purple-heart urchin," as is commonly supposed.

The byssal threads by which this curious mollusk attaches itself are exceedingly strong and coarse. Mr. Clark observed it in active motion after he had separated it, still adhering to the spines, from a *Spatangus.* He says, "When the animal marches, its foot is extended, and its rounded termination is instantly fixed to the vase in which it is deposited; then by the retractor muscle it is drawn forward, making such rapid progression as to cross a watch-glass in a minute, and on the passage turns itself several times by a twist of the foot from side to side." In another description which he has given of this operation, he uses the appropriate expression "iterumque, iterumque," to show the toilsome march of the little creature, which evidently would have preferred remaining on the sea-egg from which it was so unceremoniously dislodged to taking a long walk across and round Mr. Clark's watch-glass, in a vain search for fresh quarters of the accustomed sort. The gills and green liver are visible through the shell in some specimens which are more transparent than others, the former crossing it diagonally. The shape and position of the cartilage is very remarkable. Sometimes the shell is partly incrusted with a ferruginous deposit. The number of fry, with their shells completely formed, which are found in some individuals, is astonishing. Many hundreds of them, packed close together, and glittering like microscopic pearls, might be counted. They occupy at least two-thirds of the space enclosed within the valves of their parent; and its own body seems to be atrophied and dwindled to a mere skeleton. The shell is in fact turned into a crowded nursery. Perhaps the parent dies, like some insects, immediately after all its progeny have been developed. I do not concur in the general belief that *M. substriata* is parasitic. In one sense only can it be said to live on Echinoderms. The food of *Spatangus purpureus,* on which it is usually found, appears to consist of animalcula; and for that purpose it swallows large quantities of shell-sand, causing thereby a strong and frequent current in the neighbourhood of its mouth. The *Montacuta* probably avails itself of this indraught, and partakes of the sustenance intended for the *Spatangus,* placing itself in the way, with its alimentary tube or opening turned in the right direction. No exudation from the *Spatangus* has been noticed; and its excretions would scarcely be produced in sufficient quantity for the support of the *Montacuta,* or perhaps be suitable to it. The latter has no suctorial organ, such as is possessed by all animal parasites: it never attaches itself to the pedicellariæ or any other soft part of the echinoderm; nor has it once been detected on the back or sides, or elsewhere than in the ventral region, of its associate. It is only found on the spines close to their points.

2. M. BIDENTA'TA *, Montagu.

Mya bidentata, Mont. Test. Brit. p. 44, tab. 26. f. 5. *Montacuta bidentata*, F. & H. ii. p. 75, pl. xviii. f. 6 & 6 A.

BODY clear white: *mantle* having a bluish tinge; its margins protruded considerably beyond the shell and fringed with brilliant silvery, close-set, symmetrical, blunt, short but distinct indented points, which extend on both sides to near the beaks: *tube* scarcely perceptible, lying within the posterior margin of the shell: *foot* very large, long, broad, subtriangular, hyaline, sprinkled with flake-white spots; it is slightly bent or geniculate, and has a conspicuous byssal groove.

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* Two-toothed.

SHELL triangularly oval, or of a somewhat rhomboidal figure, compressed, rather solid and opaque, of a more or less dull aspect: *sculpture*, irregular lines of growth, and (occasionally) white longitudinal lines or streaks as in the last species: *colour* milk-white: *epidermis* not very thin, prismatic, and marked with numerous minute concentric striæ which impart to it a silky appearance under the microscope: *margins* abruptly truncate at the smaller or posterior end, nearly straight or slightly curved in front, expanding and rounded at the anterior end, and very gently sloping behind from the beak to that side: *beaks* small and blunt, prominent, somewhat incurved, with an indentation below; they are placed very much nearer the posterior side, which is not one-third the size of the other: *hinge-line* nearly rectangular, occupying about one-third of the circumference: *cartilage* yellowish, smooth, thick and globular, contained in a triangular pit lying directly under the beak in the left valve, and forming a cup-shaped process or ossicle at its base: *hinge-plate* narrow but strong, deeply excavated in the middle for the reception of the cartilage, which sometimes encroaches on the beak to such an extent as to make the latter appear broken or eroded: *teeth*, in the right valve rather short, leaf-like, and diverging inwards; in the left valve longer, and parallel with the hinge-line; those on the anterior side are the largest in both valves: *inside* nacreous and glossy, with a plain margin: *scars* obscure. L. 0·125. B. 0·14.

HABITAT: Muddy gravel and in the crevices of old bivalve shells, from 10 to 70 fathoms, everywhere from Unst to Guernsey. As an upper tertiary fossil it is recorded by Grainger from Belfast, by James Smith from Bridlington, and by Searles Wood from the Red and Coralline Crag. Its foreign range extends from Norway to Sicily. Malm has dredged it on the Swedish coast in 10–25 fathoms, M'Andrew at Vigo in 4, and off Sicily in 8 fathoms, and I have taken it at Spezzia in 18 fathoms. According to Sars it is found in the post-glacial beds of Christiania.

Clark's account of the animal is that it is "lively, marches with rapidity, and in its course turns from side to side, sometimes resting the shell on the ventral range in an upright posture." Montagu, having found it apparently burrowing in old and thick oyster-shells, believed that it was partly the cause of the small round holes so frequently seen on those shells. Such perforations, however, are attributable to a sponge (*Cliona celata*), that fills the cylindrical tubes of which the holes are the outlet, and branches off in every direction—a course never known to be taken by any mollusk. The relative proportions of length and breadth in the shell of *M. bidentata* are very variable. The young are more triangular than the adult, and somewhat resemble in shape the fry of *Nucula nucleus*. My largest specimen is a line and a half long, and a third more in breadth.

This small shell has been bandied about by different conchologists from one genus to another, and received various names. Montagu referred it provisionally to *Mya*. Brown in 1827 placed it in the genus *Anatina* of Lamarck, and Clark did the same in 1855. Gray and Hanley called it a *Petricola*. It is the *Erycina faba* of Nyst, *E. nucleola* of Récluz, and *Mesodesma exiguum* of Lovén. The *Montacuta elevata* of Stimpson, which Gould supposed was our shell, differs in the position of the beaks and in other particulars.

3. M. FERRUGINO'SA*, Montagu.

Mya ferruginosa, Mont. Test. Brit. p. 44, tab. 26. f. 5. *Montacuta ferruginosa*, F. & H. ii. p. 72, pl. xviii. f. 5, 5 *a* & 5 *b* (as *M. ferruginea*).

Body clear white: *mantle* having its margins on the anterior side produced considerably beyond the shell, and forming a kind of frill, which becomes gradually smaller and more even as it passes along the front of the shell towards the posterior side; it is fringed with very delicate, rather short, and blunt filaments, which extend completely round the edges of the valves, with the exception of a small space at the umbones: *tube* consisting of a small inconspicuous excretory orifice: *foot* very large and muscular, slightly bent in the middle, tapering to a blunt point in front and abruptly truncate behind; its base or sole is somewhat wavy and grooved through its entire length.

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* Covered with iron-rust.

SHELL oblong, convex, thin, rather opaque, glossy: *sculpture,* irregular lines of growth and occasionally a few exceedingly slight longitudinal scratches: *colour* greyish-white: *epidermis* as in the last species, but it is usually obscured by a thick ferruginous crust: *margins* somewhat truncate but rounded at the smaller or posterior end, thence obliquely slanting and slightly curved in front, expanding and rounded at the anterior end, and very gently sloping behind from the beak to that side, with a short ledge on the other side which forms an obtuse angle at the posterior extremity: *beaks* small, blunt, and rather tumid, not very prominent, and nearly straight; they are placed at about one-third the distance from the posterior end: *hinge-line* almost straight, occupying about one-third of the circumference: *cartilage* large and solid, light yellowish-brown or horncolour, obliquely twisted and clasping the hinge-plate on each side, lying close to the beaks at the posterior side; the pit or groove containing it slants abruptly and obliquely down towards the posterior side, and has its walls and base much thickened: *hinge-plate* narrow but thick: *teeth,* in the right valve one on the anterior side, which runs from the cartilage at nearly a right angle to the hinge-line and so far resembles a cardinal tooth, but it then takes a sharp twist in the direction of the hinge-line, where it becomes laminar and is gradually attenuated to a sharp point; the other tooth in the same valve on the posterior side is shorter, triangular and pointed, placed on a lower level and parallel with the posterior slope; in the left valve the tooth on the anterior side is pointed near its commencement and forms a rather long laminar ridge in a parallel line with the hinge, the other tooth being of the same shape as the corresponding one in the right valve and taking a similar direction: *inside* partly nacreous but mostly of a dull hue, with a plain and somewhat thickened margin, sometimes marked with faint lines which radiate from the beak: *scars* remarkably distinct, the muscular impression on the anterior side being larger and much longer than the other. L. 0·2. B. 0·3.

Var. *oblonga*. Shell narrower, and having the front and dorsal margins nearly straight. *M. oblonga*, Turt. Conch. Dith. p. 61, tab. 11. f. 11, 12.

Habitat: Muddy ground, from 7 to 85 fathoms, on all our coasts. It is, however, a local species, and is seldom found in a perfect state. The variety is not uncommon, and occurs with the typical form, as well as with intermediate gradations. Grainger has recorded this shell from the Belfast deposit, and Searles Wood from the Coralline Crag. Lovén and Malm have described it as Swedish, the latter giving a depth of 18–50 fathoms; Récluz found a single valve in the stomach of a turbot on the French side of the English Channel; Lamarck mentions Cherbourg as the locality for his *Amphidesma purpurascens*, which is probably our species; and I noticed it in M. Martin's collection of shells from the Gulf of Lyons.

Professor Lovén published, in the 'Proceedings' of the Royal Swedish Academy of Sciences for 1848, some important information as to the production and development of the fry of this species (as well as of *M. bidentata*); and in the 'Annals of Natural History' for March 1850 (2nd ser. v. p. 210) is contained an excellent paper by Mr. Alder on the same subject, and also with respect to the habits of the adult. My description of the animal is taken from Mr. Alder's notes. He mentions that the specimen which he observed was taken from "the stomach of a haddock—a very unpromising locality certainly for meeting with anything in a living state; but the little creature on being placed in sea-water appeared quite lively, and not visibly the worse for the uncomfortable quarters from which it had been extracted. In a short time it protruded the mantle beyond the shell, extended its large foot, and began to crawl about." And as to the fry he says, "After having kept my specimen for some days in sea-water, I found one morning that the bottom of the glass was covered with a minute white dust, which I immediately concluded would be the spawn, and on placing a small portion under the microscope I found that such was the case. I subsequently had it removed into a separate glass with a fresh supply of water, in order to observe its development. Though nearly round at first, the ova soon assumed a subtriangular shape, and about the third day strong cilia were observed on one of the sides, and they began to rotate very quickly. One after another assumed the rotatory state, till nearly the whole were in motion. After rotating for about a day, they apparently burst the envelope, and swam freely about in all directions by means of their vibratile cilia, and at the same time assumed more or less of a bell-shape—a slender style or thread projecting from the centre of the ciliated base. This organ, which has been observed in the embryos of other species, has been described as a kind of byssus, by which the little creature can fix itself securely to other bodies. This, however, I did not observe to be the case in the present instance. It soon appeared to be absorbed; the animal became gradually elongated, and the cilia were withdrawn into the shell, which then began to appear; but at what time it was actually formed I could not make out, as, from its extreme transparency and similarity of colour to the rest of the animal, it was very difficult of detection. The cilia could be seen vibrating within the shell for some time after the animal became quiescent—a few isolated cilia at one of the extremities, not observed before, being the only ones that remained to perform their functions externally. These produced a partial current without propelling the animal through the water, as at this stage it gave up its natatory habits and took to a quiet life. The internal portion, the parts of which could not be very distinctly made out, appeared to be undergoing a process of development. The mass was continually changing its form, the separate parts being extended alternately in different directions, and a portion, probably the incipient foot, was occasionally pushed beyond the margin of the shell. At this point of development further observations were unfortunately arrested by the death of the whole colony in consequence of the water becoming impure, and my situation at a distance from the sea preventing my getting an immediate fresh supply. The whole period that I had kept them was not above five or six days; so that their development had been pretty rapid. After the death of the animals the shells remained at the bottom of the glass. They were of an elliptical form, straight at the upper margin, where they were attached, though the hinge did not appear to be yet formed; the whole, excepting in the elongated form, had very little resemblance to the adult shell."

I am sure my readers will not regret my having reproduced such a faithful and striking picture by one of our great masters of British zoology. It agrees on the whole with the account furnished by Lovén, and especially with his observations as to the development of the embryo of *Modiolaria marmorata* and *Lasæa rubra.* The metamorphosis in *Modiolaria* is stated to have commenced about the third day after the spawn was deposited, being the same period as that which Alder noticed in *Montacuta ferruginosa.* The shell is apt to become coated with a thick but irregular layer of hard ochreous dirt, like iron-rust. I suspect that this incrustation is caused by a continual deposit and accumulation of fæcal matter from the animal, which is not carried off in consequence of its sedentary habits and of the water in which it lives being free from currents. The same remark applies to species of *Pisidium* and other freshwater shells, as well as to many of the marine bivalves. Forbes and Hanley observe that *M. ferruginosa* is "a scarce shell." This of course is only in comparison with other species; but the common notion of rarity is not quite correct. I consider that "local" would be a more appropriate word than "scarce" with regard to the occurrence of marine testacea. The difficulty of procuring some particular kinds may enhance their value to collectors; but probably all kinds are prolific, and differ in that respect from many of the larger land mammals. There certainly cannot exist a "unique" specimen of any shell in nature. In the present case single valves may be found in tolerable plenty on several of our sandy beaches, and perfect specimens may be got by dredging in the sheltered lochs of the west of Scotland and in rather deep water off our southern coasts. The beaks are often fissured or notched from their being squeezed close together by the strong and elastic cartilage, the shell being too fragile to resist such pressure.

The proportions of length and breadth vary greatly in specimens, which may account for the diversity of names which this species has from time to time received. As I have already incidentally noticed, it appears to be the *Amphidesma purpurascens* of Lamarck; Brown called it *Tellimya elliptica* and *T. glabra*, S. Wood *T. ovata*, Leach *Amphidesma Goodalliana*, Récluz *Erycina Franciscana,* and Lovén *Montacuta tenella.*

Among some small shells sent to me by Mr. Robert Dawson, and collected by him on the Aberdeenshire coast, is a minute single valve, which I cannot identify with any known species, whether recent or fossil. Its shape is obliquely triangular, with rounded margins; it is compressed, rather solid, glossy, and smooth or marked only by the lines of growth; the beaks are blunt and not prominent; the hinge-line is small and straight; the teeth somewhat resemble those in the right valve of *Montacuta bidentata,* but they are much shorter and nearly on a level with the hinge-line, the tooth on the broader side being considerably larger and stronger than the other; the inside is nacreous, with a plain margin. The shell appears to be full-grown; but its size is barely one-fifteenth of an inch in length, and rather less in breadth. If more specimens are found, I would propose for this species the name of *Dawsoni,* as a fit compliment to its discoverer, a zealous and intelligent conchologist.

When dredging at Falmouth in 1839 I obtained a recent single valve of the species, which Searles Wood described and figured in his Monograph of the Crag Mollusca (Palæont. Soc. Trans. 1850, p. 131, tab. xi. f. 3 *a–c*) as *Montacuta donacina,* from the Coralline Crag at Sutton. I am, no less than Mr. Wood, quite unable to say in what genus this curious shell should be placed. My specimen is a right valve, and it has a minute tubercular tooth on the longer side of a small cartilage-pit. In shape it is a miniature *Zenatia* (a genus founded by Dr. Gray), but having an external ligament.

Genus III. LASÆ'A*, Leach. Pl. V. f. 2.

Body oval: *mantle* folded on the anterior side (being the longer and larger end of the shell), so as to form a wide, but incomplete, *incurrent tube*: the *excurrent tube* is very short and inconspicuous, placed on the opposite side: *foot* long, tongue-shaped, protruding when in motion through a slit in the excurrent tube at its base.

Shell roundish-oval: *beaks* straight: *cartilage* long and cylindrical, divided or split lengthwise, and clasping the hinge-plate, in each valve, on the smaller and narrower side of the shell, being the posterior end: *hinge* containing in the left valve a minute thorn-like cardinal tooth, and in each valve two remarkably strong lateral teeth.

The late Captain Brown proposed this genus in 1827, on the authority of Dr. Leach, for the *Cardium rubrum* of Montagu; and although he says nothing about the animal, and not much more about the shell, I think the genus is a good one, and I therefore adopt the name above given to it. M. Récluz, apparently unaware of his having been anticipated, gave in 1843 another name (*Poronia*) to the same genus; but his description is positively incorrect. He says of the animal, that it has on the posterior side two lobes, and two tubes which are disunited; and of the shell, that the hinge has two cardinal teeth in each valve, besides lateral teeth, and that the cartilage is placed in an oblique groove. It will be seen that my description of the generic characters is very different from that of M. Récluz; and were it not for the certainty that we both mean not only the same genus, but also the same species, I could not believe that our respective descriptions had been drawn from the same object. The present genus is intermediate between *Montacuta* and *Kellia*, and partakes of the leading characteristics of each. With the former it agrees in having the cartilage placed at the shorter end of the shell, a position contrary to that in *Kellia,* and with the latter in the mantle being folded on the anterior side, though not so completely as in that genus. The position of the cartilage or ligament is by no means unimportant, because it indicates the posterior side; and the empty shell thus serves to determine the place, and often the nature, of the organs which had composed the frame of its late occupant.

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* A meaningless name; possibly a corrupt derivation from *λαισήϊον*, a little shield.

It is very probable that the shell which Adanson called "Le Poron" belongs to this genus; but his notice of it is unusually brief and obscure. He says that it has two small triangular teeth in each valve, which form the hinge, that it is at most only two lines in diameter, and that it is whitish and sometimes of a violet colour, chiefly towards the hinge. He evidently did not know the animal, for he included the *Poron* among the species of his genus *Chama,* which he described as having three openings in the mantle, two of which take the form of a rather long tube. It would be a waste of etymological research were we to endeavour to trace the derivation of the word "Poron." Adanson tells us, in the preface to his most admirable work on the Mollusca of Senegal, that he preferred inventing such chance names as had the least meaning, and had no relation to other names or known objects. Perhaps Dr. Leach had the same idea in selecting some of his generic names. However that may be, in his posthumous work on the Mollusca of Great Britain he seems to have changed *Lasæa* for the more classically correct name of *Autonoë,* placing it in the family *Veneridæ,* although calling the species (after describing it) "*Lasea rubra.*"

The *Lasææ* are of a minute size, and usually inhabit the littoral zone, where they congregate in vast numbers, at the roots of small seaweeds, as well as in the crevices of rocks and in the empty shells of *Balani*. On some coasts they live as much out of the sea as in it, a sufficient supply of water being retained within the close-fitting valves to keep the gills moist until the return of the tide; and in many cases they must fast for a long time, because they are found in places which are covered by the sea at high springs only. A little fresh-water bivalve (*Pisidium pusillum*) is also occasionally amphibious. We have but one species of *Lasæa*, and that is viviparous. Other species, however, have been noticed in various parts of the world:

> ". . . . . . Pr'ythee, think
> There's livers out of Britain."

1. Lasæa ru'bra*, Montagu.

Cardium rubrum, Mont. Test. Brit. p. 83, tab. 27. f. 4. *Kellia rubra*, F. & H. ii. p. 94, pl. xxxvi. f. 5–7 (as *Poronia rubra*), and (animal) pl. O. f. 3.

Body white: *mantle* having its margin apparently plain and without tentacles: *excurrent tube* sessile and concealed within the mantle: *foot* broad at the base, the extremity being rather rounded than pointed; its bluish-white and transparent hue is variegated by a line of dull but intense flake-white, which runs from one end to the other.

Shell oval, with often a circular or triangular and rather oblique outline, ventricose, not very thin or glossy: *sculpture*, distant lines of growth and close-set wavy concentric striæ, besides more numerous but much finer longitudinal striæ, which are so excessively minute as only to be seen with a powerful lens: *colour* milk-white, tinged more or less deeply with purplish-red, especially towards the hinge: *epidermis* yellowish, rather thick: *margins* somewhat truncate and rounded at the smaller or posterior end, slightly curved in front, with sometimes a byssal sinus or indentation in the middle, produced or wedge-like and rounded at the anterior end: *beaks* broad, blunt, prominent, and contiguous; they are placed about two-fifths nearer to the posterior end: *hinge-line* curved, occupying rather more than one-fourth of the circumference: *cartilage* large, yellowish-horncolour, attached to the shell below the hinge-plate and lodged on an oblique shelf: *hinge-plate* very broad, thick, and strong: *teeth*, in the right valve two triangular laterals with sharp points, the anterior of which is a little more raised than the other; in the left valve similar laterals, besides a minute cardinal and erect tooth directly below the beak; the laterals in each valve lock into corresponding grooves in the other: *inside* partially nacreous, but otherwise of a dull hue; margin plain: *pallial scar* scarcely visible, but evidently existing on account of the adhesion of the mantle inside the front margin: *muscular scars* oval and distinct. L. 0·85. B. 0·1.

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* Red.

Var. *pallida*. Shell yellowish-white and nearly transparent, without any tinge of purple or red.

HABITAT: Everywhere in crevices of rocks, inside the empty cups of *Balani* and among the tufts of *Lichina pygmæa*, near high-water mark, and at the roots or footstalks of *Corallina officinalis* and other seaweeds, and on mussel-beds, between tide-marks; sometimes it is found at depths varying from 3 to 20 fathoms. The variety is not uncommon. This species is a Coralline Crag shell. Steenstrup has found it in Iceland, and Lilljeborg at Grip in Upper Norway; but I am not aware of any other northern locality. It is widely diffused southwards from the north of France to the Canary Isles, and throughout the Mediterranean. Specimens for which I am indebted to the kindness of Mr. Cuming (so renowned for his unrivalled collection of shells, as well as for the extent of his conchological experience), and taken by him on the south-western coast of America, cannot be distinguished from the European species; and Dr. Philip Carpenter is of opinion that a species from the Gulf of California is the same as ours.

L. rubra has been recorded by Sars among arctic shells occurring in newer tertiary strata in the diocese of Christiania.

Dr. Turton was the first who noticed the curious fact that this minute mollusk is viviparous. It does not appear to be prolific, as seldom more than twenty young ones are to be seen at any one time in the shell of the parent. They are fully formed while in this stage of growth, and their shells have even a tinge of purplish-red on each side of the beaks. Mr. Clark says the ovary contained no young in specimens which he procured in the winter. The same may perhaps be said of most mollusca, whether viviparous or oviparous, as well as of other animals the season of whose loves in a state of nature does not commence until

> " . . . . . . species patefactast verna diei,
> Et reserata viget genitabilis aura favoni."

A discussion took place some years ago, between Mr. Clark on the one side, and Messrs. Alder and Hancock on the other, as to the use of the anterior tube in this species and in *Kellia suborbicularis*, both of which are viviparous. Mr. Clark contended that it was an organ of reproduction, in consequence of his having observed the fry ejected through it. His opponents disputed this uterine function, and showed that the tube serves to convey water to the gills. My own observations induce me to believe that it has various uses—one for obtaining food, another for aërating the gills, and a third for the expulsion of the fry. The tube seems to be expanded or contracted at the will of the animal, being formed merely by an overlapping of the folds of the mantle. Its sides are never united. The present species is rather active in its habits. According to Mr. Clark, it immediately fixes itself, when placed in a basin of sea-water, by its threadlike byssus. The foot protruded, but not in action, occupies a central position : it is usually pushed through the slit at the base of the tube on the anterior side when the animal wishes to move forwards, and, fixing itself by a kind of suction, rapidly draws the shell after it; and it can also execute a similar movement backwards, but more slowly. The animal never remains long without forming a byssal attachment; but when inclined to move, it seems to have no difficulty in slipping its cable, which is always discarded and left *in situ*. The surface of the shell is sometimes coated with confervoid spores, giving it a greenish appearance. My largest specimens are from Shetland.

Walker first noticed and figured this species in his account of minute and rare shells from Sandwich; but his description was excessively meagre, and no specific name was added. It is in all probability the *Amphidesma nucleola* of Lamarck, *Erycina violacea* of Scacchi, *Cycladina Adansonii* of Cantraine, *Erycina Fontenayi* of Mittré, and *Bornia seminulum* of Philippi. Stimpson remarks that the *Kellia rubra* of Gould is not our species, having a more compressed form and much smaller beaks. He therefore gave the name of *planulata* to the North-American species. Gould's figure seems to represent *Montacuta bidentata*.

Genus IV. KEL'LIA [*], Turton. Pl. V. f. 3.

Body globular : *mantle* folded on the anterior side (being the shorter and smaller end of the shell), so as to form a bag-shaped *incurrent tube*, and folded on the opposite side into an *excurrent tube*, which is more prominent but shorter : *gills* two, symmetrical, and nearly triangular: *lips* two, of a similar shape: *foot* long, tongue-shaped and bent, placed in the middle of the front margin.

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[*] Named after the Rev. J. M. O'Kelly of Dublin, a conchological associate of Dr. Turton.

SHELL globular: *beaks* incurved: *cartilage* cylindrical, placed on the hinge-plate at the posterior side (being the broader and larger end of the shell): *hinge* containing in the left valve a thick, erect cardinal tooth, and in each valve two remarkably strong laminar teeth which are partly cardinal and partly lateral.

This genus differs from *Lasæa* in the incurrent tube being more complete and the excurrent tube conspicuous, in the foot being placed in the middle of the ventral margin (instead of on the anterior side and protruding through a slit at the base of the larger tube), but especially in the position of the cartilage, which lies on the broader and larger side of the shell, supporting the hinge-plate, and *outside* of the lateral teeth, and not (as in the last genus) placed on the narrower and smaller side of the shell, nor clasping the hinge-plate *inside* and below those teeth. The habits of the present genus are also different from those of *Lasæa.* This is not amphibious, and probably cannot exist if constantly left high and dry by the receding tide. It usually inhabits comparatively deep water, and prefers a muddy ground. Both are viviparous: but at least one species of *Montacuta* has the same mode of reproduction. In the shape of its shell *Kellia* resembles *Sphærium*; but that genus has an external ligament and differs from this in the number and arrangement of the teeth. The position of the tubes is also very dissimilar in these genera. In *Kellia,* as well as in *Lasæa,* it is somewhat anomalous, the larger and incurrent tube being placed at one end, and the smaller and excurrent tube at the other. In *Sphærium* and most other genera which have two tubes, both are placed on the same side;

and the *Sphæriidæ* possess the peculiarity of their tube or tubes being situate at the shorter and smaller side of the shell, which may therefore be considered the posterior end, the ligament being situate at the other end.

Philippi described the present genus under the name of *Bornia*, though not without some suspicion of its being identical with *Kellia*. He remarks that he had no means of seeing Turton's work on the British bivalves. One character of his genus he conceives to be of very great importance; and that is the absence of any mark of a fold of the mantle—"sinus palliaris nullus." There must be some mistake in this. The character exists in Mediterranean as well as in British examples of the typical species. Perhaps Philippi meant to say that the pallial scar in *Kellia* is not sinuated as in the *Veneridæ* and allied families.

It may be well here to say that, in describing the right and left valves, I have followed the rule laid down in Dr. Gray's "Conchological Observations" (Zool. Journ. i. p. 208), viz., "When a bivalve shell is placed on its basal margin, with the ligament towards the observer, the right and left valve will correspond with his own sides." Some rule of this kind is indispensable, in order to ensure a uniform method of description; but it appears of late years to have been left to the caprice of every author.

Many species of *Kellia* are known in a recent and fossil state. During the formation of the Crag strata, within the area which is bounded on the west by the counties of Norfolk, Suffolk, and the adjacent corner of Essex, several kinds flourished; but of these one only is known to have survived, and still exists in the British seas.

1. Kellia suborbicula'ris *, Montagu.

Mya suborbicularis, Mont. Test. Brit. p. 39, tab. 26. f. 6. *K. suborbicularis*, F. & H. ii. p. 87, pl. xviii. f. 9, 9 *a* & 9 *b*, and (animal) pl. O. f. 4.

Body white and nearly transparent: *mantle* protruding beyond the shell in front, and having its margin fringed with a few thornlike or triangular tentacles: *incurrent tube* varying in length and diameter even in the same individual; its orifice plain, but uneven: *excurrent tube* short: *gills* pale yellow and striated: *lips* thick, strong, and coarsely striated: *foot* compressed, flexible, and hyaline.

Shell usually globular, but sometimes inclined to an oval or triangular outline, ventricose, rather thin, and more or less glossy: *sculpture*, distant lines of growth, and close-set and irregular concentric striæ, besides some slight longitudinal lines: *colour* milk-white, with a faint tint of yellow: *epidermis* thin and beautifully iridescent: *margins* somewhat truncate but obliquely rounded at the larger or posterior end, a continuous curve being formed by the ventral and anterior sides: *beaks* circular and calyciform, incurved and twisted towards the anterior or smaller end, close together, but not contiguous: they are placed nearly in the centre of the dorsal margin, and there is a depression or incomplete lunule formed below them: *hinge-line* curved, occupying nearly one-third of the circumference: *cartilage* triangular, yellowish-brown, attached to the hinge-plate close to the inner margin of the dorsal side, and doubled on itself: *hinge-plate* narrow, but strong: *teeth*, in the right valve two strong laterals, the one on the anterior side being at first erect and resembling a cardinal tooth, and then (as in *Montacuta ferruginosa*) becoming laminar and attenuated, that on the posterior side being obliquely triangular; in the left valve a recurved cardinal tooth, and two laterals similar to those in the other valve, the cardinal and anterior lateral forming a double tooth for the reception of the corresponding lateral in the right valve; dental sockets deep: *inside* like frosted silver, with a slight prismatic lustre: *pallial scar* indistinct: *muscular scars* large and conspicuous. L. 0·4. B. 0·45.

Var. *lactea*. Shell somewhat compressed and oval, of a thinner texture and rather more glossy; front margin nearly straight, and dorsal margin raised more to a level with the beak. *Tellimya lactea*, Brown, Ill. Rec. Conch. p. 106, pl. xlii. f. 10, 11.

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* Nearly globular.

HABITAT: Fine mud in the cavities of dead bivalves from deep water, and occasionally under stones at the lowest verge of spring tides, sometimes occupying the excavations made by other animals in hard rocks. Its bathymetrical range extends to the line of soundings round our coasts. The variety is not so common: it is the *K. Cailliaudi* of Récluz. The typical form occurs in the Clyde beds (Smith), and in the Red and Coralline Crag (S. Wood). It is found in the Scandinavian seas, as far north as Finmark, in 10–50 fathoms, and also throughout the Atlantic and Mediterranean, the Canary Isles and Sicily being its southernmost known limits. The Rev. P. Carpenter has enumerated it as a Californian species.

Montagu discovered this pretty shell in hard limestone; and he remarked that the opening of the excavations which it inhabited was smaller than the shell, so that it must have entered in a younger state, and never could have got out. It is, however, not a borer. I have often found it in the tortuous and deserted galleries made by Annelids; and its shape is sometimes altered or even distorted in consequence of its confined position. The shells of such specimens are thicker than usual, and the epidermis is in a great measure abraded. Both Alder and Clark have published some excellent observations as to the habits of the animal. The former says it moves freely by means of its strap-shaped foot, which is frequently protruded in all directions. Its progress is usually forward; but sometimes it crawls backwards or sideways, especially when it is ascending a perpendicular surface, which it frequently does for the purpose of suspending itself by its byssus.

The byssal sinus is about halfway up the foot on the posterior side; and from it the animal produces a very delicate thread, and suspends itself freely (with the beaks of its shell downward) by a single almost inconspicuous fibre, which is strengthened by a double attachment at the top. In this posture it appears to rest for some time, with both tubes open, and the foot partly withdrawn into the shell. According to Mr. Clark, the byssus spun by the kind which is found in rocks consists not merely of delicate filaments such as free individuals of the ordinary form throw out when placed in a saucer, but of a membranous plate which cannot be detached without some force. He also says that the larger tube in free specimens (having a thinner shell) is marked with flake-white longitudinal lines, which do not appear in the rock specimens. He found in the ovary of one individual ova in an advanced state, together with fully-formed testaceous fry. M. Récluz has lately announced the same fact with regard to the variety *lactea*. The ova mentioned by Mr. Clark, and which through his kindness I have had an opportunity of examining, are bean-shaped, and closely resemble a minute form of *Cythere*. They are very different from the fry, which are perfectly spherical. Dr. Gordon has remarked that *K. suborbicularis* is occasionally seen as part of the food of the haddock. Sometimes the shell is extremely thin, and so transparent that the gills are distinctly visible through it, causing the surface to appear obliquely striated. The cartilage is always ruptured and divided when the shell is fully opened, one half being left in each valve. The teeth vary somewhat in shape and relative position.

This species is the *Erycina pisum* of Scacchi, *Bornia inflata* of Philippi, and *Oronthea Montaguana* of Leach, who placed it in the *Mya* family. The *Tellimya tenuis* of Brown seems to have been constituted from a specimen which had lost one of its cardinal or front teeth. It must have been knocked out after death. Any one but a conchologist may well ask why these hinge-processes are called "teeth," seeing that they are not homologous to the teeth of Vertebrate animals, and that they are always placed at the back, instead of in front, of a headless creature. But the word, whether rightly or wrongly used, has now become "household" and unchangeable. I hope those out of the scientific pale will accept this explanation: if they are not satisfied, the Hudibrastic distich may serve their purpose—

> "To them we leave it to expound
> That deal in sciences profound."

To the present genus must be referred provisionally the *K. cycladia* of Searles Wood, a rare Coralline Crag shell. To this species I am now inclined to refer a shell which I found in the Shetlands and named *Poromya subtrigona*. A description and figure of it will be found in the 'Annals and Magazine of Natural History,' 3rd series, January 1858, p. 42, pl. ii. f. 1. I had then only a single (the left) valve, which I sent to my friend Mr. Barlee for his inspection; but unfortunately the box containing it was crushed on being returned to me through the post, and a few fragments are all that remain of the original specimen. Since that time I have fortunately discovered another (the right) valve in my dredgings on the same ground, and I have no doubt that more specimens will hereafter be found. However, I do not at present consider the species, or even its generic position, sufficiently established to warrant its redescription. The cartilage is internal, and lies on the narrower and smaller side of the shell, as in *Lasæa*. The right valve has a small tubercular cardinal tooth, a strong lateral tooth on the anterior side, and a very indistinct one on the posterior side. The hinge of *Poromya* is differently constructed; and I was wrong in placing the Shetland shell in that genus. The form is peculiarly oblique; but otherwise it has somewhat the appearance of *Axinus flexuosus*. Searles Wood thought his species might be the *Scacchia ovata* of Philippi; but I cannot agree with him that there is even any resemblance between them.

Family IX. LUCI'NIDÆ, D'Orbigny.

Body nearly globular: *mantle* closed, except in front, where there is a large opening for the egress of the foot and to admit water to the gills, and also at the posterior side, where there are usually one or two tubes or orifices for alimentary and excretal purposes; its edges are thickened and adhere closely to the inside of the shell: *gills* (in all the genera but *Axinus* and *Diplodonta*) one only on each side: *lips* (or *labial palps*) short, and (except in those genera) two in number: *foot* extremely long, tubular and extensile.

Shell more or less circular, equivalve in all cases but an exceptional one, nearly equilateral, of different degrees of solidity, in some instances almost smooth and in others curiously sculptured, completely closed: *epidermis* thin: *beaks* incurved: *lunule* usually distinct: *ligament* (except in *Loripes*) more or less external: *hinge* furnished with cardinal and lateral teeth or with some of them, but occasionally toothless: *pallial scar* entire: *muscular scars* very conspicuous, that on the anterior side unusually elongated and extending far within the shell in a parallel line with the front margin.

Poli, Valenciennes, Clark, and Deshayes devoted much labour to the elucidation of this family as a natural group, and have published some important observations on the animal. But we still need further information, especially as to the branchial apparatus.

According to Valenciennes, the animal of *Lucina* has but a single gill-leaflet on each side. Forbes and Hanley state that there can be little doubt that two lamellæ on the same side are so united as to appear like a single gill. Deshayes has shown that the two gills when divided contain four rows of vessels, and that they occupy as much space as all the gills in other Conchiferous mollusks. As I do not pretend to be, like Sidrophel, "old dog at physiology," I can say no more than that I hope the question may be sooner or later set at rest. The foot is a remarkable and peculiar organ. When at rest and contracted, it looks like a shrivelled worm, and is doubled up within the shell; but when the period for action has arrived, the wrinkles disappear, and in a marvellously short time the foot expands and is drawn out to three times the length of the whole body. It is thus rendered firm and more capable of muscular exertion. This distention is effected by means of aquiferous ducts or canals, which permeate the tissue of the foot, the water being introduced at its base through a wide funnel opening directly into the visceral cavity. A similar organization of the foot has been noticed in the Cephalophorous mollusks, especially in some of the *Muricidæ, Naticidæ,* and *Bullidæ,* which have the same habit of burrowing as the *Lucinidæ.* Another peculiarity which characterizes the present family is the elongation of the anterior adductor muscle; and it is easy to recognize the fossil species by the nature of the scar or mark inside the shell. The ligament is more or less external in all the genera but *Loripes,* which has an internal cartilage concealed within the hinge-line and occupying an oblique groove, as in *Kellia.*

The *Lucinidæ* inhabit sandy mud and gravel, in which they shelter themselves. Very many recent species of different genera have been described from various parts of the world; and fossil species are still more abundant.

The "family likeness" is unmistakeable, and this constitutes part of the value of the *Lucinidæ* as a natural group. After much consideration and study of the question, and with great respect for the opinion of the authors of the 'British Mollusca' and of M. Deshayes, I cannot agree with them that the long-established genera of *Loripes* and *Axinus* ought to be merged in *Lucina*. The great French conchologist has lately made a strong protest against the dismemberment of the last-mentioned genus; and he wishes it to be retained, like the once glorious republic of his own country, "une et indivisible." To use his own words, it forms "une grande unité." It may, however, be questionable if the characters on which he lays so much stress do not apply not only to the genus, but to the family which has sprung from it, and whether there are not other characters, although perhaps of inferior value, that may serve to distinguish several genera. I believe that such characters exist, and I will endeavour to point them out in the proper place. It can hardly be disputed that each group of natural objects, whether we call it a kingdom, class, order, family, genus, species, or variety, has some peculiar feature of its own, although we may not be able to detect it. The imperfection of our knowledge has hitherto combined with the limited capacity of our intellect in keeping us but partly enlightened; and this must ever continue to be the case, until the whole scheme of Nature, past and present, has been unfolded to our view. Perhaps, even to the greatest philosopher of modern days,

> "Science appears but what in truth she is,
> Not as our glory and our absolute boast,
> But as a succedaneum, and a prop
> To our infirmity."

Genus I. LO'RIPES*, Poli. Pl. V. f. 4.

Body somewhat compressed: *mantle* having the margin notched: *incurrent tube* rather long and wrinkled: *excurrent tube* sessile: *foot* awl-shaped.

Shell almost equilateral, irregularly cancellated, or sculptured by flexuous striæ: *lunule* short: *ligament* (or rather the *cartilage*) quite internal: *teeth*, one cardinal in the right, and two in the left valve; laterals remote and sometimes indistinct.

The celebrated Neapolitan conchologist, Poli, who founded this genus, described the shell under another name—that of *Loripoderma*—a hybrid compound, or "Babylonish dialect," which fortunately we are not obliged to use. It may be known from *Lucina* by the different position of the ligament or cartilage, which is external in that and internal in this genus. Deshayes is of opinion that the structure of the ligament is of more consequence than its position; but the structure or composition of every kind of ligament or cartilage is the same, and it appears to me that the position of this apparatus deserves to be considered in any scheme of classification. Any one character, if certain and not liable to vary in the same genus, is as good as another for this purpose.

Searles Wood says that "this is a recent genus, and its age, as far as it is known to me, does not extend beyond the middle tertiaries." It is difficult to distinguish the genus *Ungulina* of Daudin from *Loripes*. According to Chenu, the ligament in *Ungulina* is external; but its exact position is in a groove on the hinge-plate, within the dorsal margin.

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* So named from the thong-shaped foot.

A. Shell concentrically ribbed and slightly decussated by longitudinal striæ; lateral teeth indistinct.

1. LORIPES LAC′TEUS *, Linné.

Tellina lactea, Linn. Syst. Nat. p. 1119. *Lucina leucoma*, F. & H. ii. p. 57, pl. xxxv. f. 2 (as *L. lactea*).

BODY whitish: *foot* cylindrical, and swollen in the upper part.

SHELL usually of a somewhat globular form, but varying in comparative length and breadth, rather solid and opaque, not glossy: *sculpture*, distant lines of growth and fine, irregular and close-set concentric striæ, as well as equally fine and irregular but less numerous longitudinal striæ or scratches, which radiate from the direction of the beak, and cause the surface to be partly decussated: *colour* white, with a tinge of yellow: *epidermis* forming a mere film, and slightly iridescent: *margins* rounded and sometimes indented or sinuous on the anterior side, curved in front, and slightly truncate although rounded on the posterior side: *beaks* small, rather prominent, much incurved and close together; they are placed very nearly in the middle of the dorsal margin: *lunule* deep and heart-shaped: *hinge-line* flexuous, occupying about one-fourth of the circumference: *cartilage* yellowish-brown, shaped like a lance-head, divided into two semicylindrical portions, each of which fills a groove on the hinge-plate in either valve, sloping obliquely downwards from the beak within the line of the posterior lateral tooth, and terminating abruptly in the interior of the shell: *hinge-plate* broad and strong: *teeth*, in the right valve one triangular cardinal, and occasionally a small denticle, besides two indistinct laterals (one on each side), which are more or less raised and pointed at the end; in the left valve a double cardinal, which receives that of the opposite valve in an intermediate socket, and two laterals as in the other valve; the posterior lateral is much the longer: *inside* somewhat nacreous, but of a dull hue; margin smooth and plain: *scars* large and remarkably distinct. L. 0·7. B. 0·7.

Var. *Desmarestii*. Shell flatter and thinner. *Lucina Desmarestii*, Payraudeau, Cat. Moll. Corse, p. 44, pl. i. f. 19, 20.

HABITAT: Muddy gravel and sand on the coasts of our southern, south-western, and south-eastern counties, and in the south and west of Ireland; Llyn, Carnarvonshire (Pennant); Scarborough (Bean); Seaton, Durham (Hogg, *fide* Alder); and Mr. Dawson has dredged a single valve off Buchan in Aberdeenshire at some distance from land. In the Channel Isles it lives in the sand at low tides; and it is usually found elsewhere at a depth of only a few fathoms. The locality "Scalloway," given in the 'British Mollusca' on my authority, is incorrect; and Mr. M'Andrew informs me that a similar mistake must have occurred in quoting him as having taken this species in Zetland. The variety is from Southampton and Bantry Bay. I am not aware that this species has ever been found in the north of Europe. South of Great Britain it is widely distributed through the Atlantic, Mediterranean, and Ægean seas; its furthest limit appears to be the Canary Isles.

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* Milk-white.

The shell varies considerably in the degree of globoseness, and in the proportions of length and breadth, as well as in the development of the teeth. Very young specimens have an oblique contour and are much broader than long.

Philippi was of opinion that this species is not the *Tellina lactea* of Linné, because the latter is described as "gibba." Believing, moreover, that the present species is that which Lamarck designated *lactea*, he proposed the name of *fragilis* for Linné's species. Forbes and Hanley subscribed to Philippi's view, but changed the specific name of our shell to *leucoma*. I do not see any necessity for this shifting nomenclature. The *Lucina leucoma* of Turton, if we may trust his description and typical specimens, is scarcely a variety of the shell commonly called *L. lacteus*. Lamarck appears not only to have made two species out of the old one, but to have placed them in different genera, one in *Lucina* as *L. lactea*, and the other in *Amphidesma* as *A. lucinalis*.

B. Shell marked by flexuous striæ; lateral teeth distinct.

2. L. divarica'tus *, Linné.

Tellina divaricata, Linn. Syst. Nat. p. 1120. *Lucina divaricata*, F. & H. ii. p. 52, pl. xxxv. f. 3.

Shell resembling that of *L. lacteus* in shape, but more tumid and having an oblique outline, thick and opaque, rather glossy: *sculpture*, numerous imbricated and flexuous striæ, which bend from the middle of the shell to each side with a gentle curve, the highest point or centre of the curve being in the direction of the beak; the striæ are irregularly concentric in the umbonal area, and become flexuous in the subsequent stage of growth; the surface is also marked by minute close-set longitudinal striæ or lines as in the last species: *colour* white with a slight tinge of yellow: *epidermis* so thin as to be scarcely visible: *margins* rounded on all sides, except where the beak projects; the posterior is the highest and forms a kind of shoulder: *beaks* very prominent, gibbous, close together, and twisted towards the anterior side: *lunule* deep, heart-shaped, and defined on each side by a strong ridge: *hinge-line* curved, occupying not quite one-fourth of the circumference: *cartilage* light horncolour, narrower than in *L. lacteus*, but similar in shape and position: *hinge-plate* rather broad and strong: *teeth*, in the right valve one strong blunt cardinal, and a long, sharp and raised lateral on each side; in the left valve two cardinals, one of which is strong and blunt, and the other very much smaller and on a lower level, besides two laminar laterals on each side, receiving between them the single lateral on the corresponding side of the other valve; the posterior laterals are the longest: *inside* slightly nacreous but of a dull hue; margin finely crenulated: *scars* large and distinct, that left by the anterior adductor muscle being not much longer than the other. L. 0·4. B. 0·4.

Habitat: South coast of England, but exceedingly rare. Montagu obtained a single valve from dredged sand at Falmouth; Turton records it from the Land's End and Teignmouth, although the only specimen in his collection appears to be from the first of those localities; and I fortunately obtained in 1839 two valves (right and left, but not a pair) by dredging in muddy sand, at a depth of about 15 fathoms, off St. Mawe's Creek near Falmouth, some miles outside the harbour, and where no ballast had ever been deposited. *Mytilus Adriaticus* occurred on the same ground; and a living specimen of *Tellina balaustina* has since been got there by trawling. Another locality is, according to Dr. Leach (on the authority of Dr. Knox), "southern seas of Scotland, between Arran and Bute and the Mull of Cantire;" but the length and height of a specimen said to have come from that quarter are suspicious, "one inch and threequarters." It must have been the common West-Indian shell generally known as the *Lucina divaricata* of Lamarck and *L. quadripartita* of D'Orbigny. Searles Wood has described the present species from the Mammalian and Red Crag. Collard des Cherres states that it has been found alive at Quélern in Brittany; and it unquestionably inhabits all the seas of Southern Europe, as well as the coasts of Madeira and the Canaries. Dr. Gould included it in his list; but Stimpson considers the Massachusetts shell to be a distinct species, and has called it *Lucina strigilla*.

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* Spread out, with reference to the different directions exhibited by the markings on the shell.

This is the *Lucina digitaria* of Poli, *Cardium discors* of Montagu, *Lucina undularia* of Searles Wood's Catalogue, and *L. commutata* of Philippi.

A valve of a much smaller species, which is frequently seen in parcels of West-Indian shells, was sent between forty and fifty years ago by Mr. Dillwyn to Col. Montagu for his opinion. It was marked "foreign," and returned by the latter with a note in pencil, "not *C. discors*." The specimen and memorandum are close beside me while I am writing. I mention this because there seems to have been some confusion as to what species Montagu intended by his *Cardium discors*. Nearly the whole of his priceless collection of British shells, which he presented to the National Museum, has unluckily been lost to science; and even some of the few specimens that are still preserved were many years ago removed from the original tablets, no care having apparently been taken in the course of rearrangement to retain the names affixed by the donor to his types. No similar neglect, however, has happened of late years; and all that can now be desired by the public to ensure proper care being taken of our unrivalled store of scientific wealth, and its being made available for the instruction and amusement of the people, are more space and a larger staff.

Dr. Pulteney, Mr. Bryer, and Dr. Maton are reported to have found the *Venus tigerina* of Linné (a species of *Loripes*) on several parts of the Dorset coast. There is no likelihood, much less satisfactory evidence, that it is indigenous. It inhabits tropical seas.

Another species, the *Venus orbiculata* of Montagu, said to have been found by Laskey at Dunbar, is also spurious. It is the *Lucina squamosa* of Lamarck, and West Indian.

I was assured by Dr. Lukis that the *Tellina carnaria* of Linné had been taken alive at Guernsey; and I have noticed it on the Continent in collections of Mediterranean shells. Most writers on British and European conchology have given it a place in their lists; and Middendorff asserts that it is a native of the Caspian Sea. But although I may be over-sceptical, I must hesitate before I can recognize its claim to be admitted into the British fauna. It is so common a West-Indian shell that the circumstance of its appearing on any of our shores (particularly those which are much frequented) is no proof of its inhabiting the adjacent sea. Shipwrecks, ballast, sailors returning home from foreign voyages, or children playing on the sands, might account for any exotic shells being found in such places. One thing, however, ought to be noticed with regard to the species in question, viz. that the *Tellina Balthica* (or *solidula*) was mistaken for it by some of the old writers. After describing that species, Lister gives the following locality, "In brevibus Lancastriensibus." Linné cites Lister, and uses the same word "brevibus" (shallows) coupled with "oceani" in denoting the habitat of his *T. carnaria*. Gmelin tried to improve this, and says, as to the last-named species, "Habitat copiosissima in Angliæ sinubus et insularum oceani Americani littore." Da Costa and Donovan followed suit, the former making a further emendation by altering the name to "*Cardium carneosum*." Whether the *Tellina carnaria* of Linné belongs to the present genus has not yet been satisfactorily determined.

The *Tellina pisiformis* of Linné may possibly be British. Montagu described it as *Cardium arcuatum*, and said that it had been dredged up in Falmouth Harbour with sand for manure. I have a single valve that was found in Cornish shell-sand. It is a well-known Mediterranean species; and De Gerville records it, by the name of *C. discors*, from Querqueville on the coast of Brittany. Gmelin called it *Tellina digitaria*, and Lamarck *Lucina digitalis*. The sculpture is very different from that of *Loripes divaricatus*. In that species the striæ are arched in the line of growth and thence diverge to each side. In the present species the striæ run obliquely from one side to the other, curling upwards at each end. *L. divaricatus* is very convex, white with a tinge of pale yellow, and rather glossy, while *L. pisiformis* is compressed, and has a rosy tinge and dull hue. The markings on the latter shell are such as may be seen on the tip of a finger, and from these the names *digitaria* and *digitalis* have been derived. It occurs in the Red and Coralline Crag. In consequence of the anterior muscular impression being simple, Searles Wood placed this shell provisionally in *Astarte*; and Deshayes has lately formed out of this and other allied fossil species the genus *Woodia*, a just compliment to our distinguished palæontologist.

Genus II. LUCI'NA*, Bruguière. Pl. V. f. 5.

BODY somewhat compressed: *mantle* having the margin waved: *incurrent* as well as *excurrent tube* sessile: *foot* tongue-shaped.

SHELL rather inequilateral, concentrically ridged: *lunule* long and well defined: *ligament* for the most part external: *teeth*, one or two cardinals in the right, and always two in the left valve, one of which latter is often cloven; laterals long and laminar: *inside* chalky and pit-marked.

Although this genus has been divided, it must be borne in mind that very nearly three-fourths of a century have elapsed since it was first instituted. The progress of conchological discovery has been unusually rapid during the last twenty years, owing in a great measure to the impulse and encouragement given to the study of the Mollusca by publications specially devoted to it, as the 'Zeitschrift für Malakozoologie,' 'Malakozoologische Blätter,' and 'Journal de Conchyliologie,' and not less to the continual and successful labours of Deshayes, Dunker, Pfeiffer, Hanley, Reeve, H. & A. Adams, Mörch, Fischer, and other writers on the subject. New forms are every day being brought to light, and require the former system of classification to be modified. The old tree has put forth a greater number of new shoots than the branches which have been severed from it, and it is not less vigorous for the pruning; even the loppings, that have been planted and carefully tended, are flourishing, and bid fair to rival their parent stem. Species of *Lucina* abound in tropical seas, and Dr. Philip Carpenter has enumerated no less than seventeen as inhabiting the west coast of North America. Lamarck asserted that in certain species the teeth become obliterated by age and disappear, which statement has been repeated by subsequent writers. The British species present no such anomaly; on the contrary, their teeth are developed in the course of growth, and become stronger and more conspicuous in the adult than in the young.

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* An epithet of Juno.

1. LUCINA SPINI′FERA *, Montagu.

Venus spinifera, Mont. Test. Brit. p. 577, pl. 17. f. 1. *L. spinifera*, F. & H. ii. p. 49, pl. xxxv. f. 1.

BODY clear white: *foot* very slender, and not swollen.

SHELL obtusely triangular, with a somewhat oblique outline, compressed, solid and opaque, not glossy. *Sculpture*, about 30 fine, plate-like concentric ridges, which are slightly imbricated, their edges forming sharp spines on the dorsal margin; these ridges are more regular and equidistant in the young than at a later stage of growth; between them are extremely numerous and fine, but irregular concentric striæ; and there are here and there a few longitudinal lines which are not visible to the naked eye: *colour* pale yellowish-white: *epidermis* fibrous and not very thin: *margins* slightly incurved on the anterior side, which joins the ventral margin at almost a right angle, rounded in front, somewhat truncate on the posterior side, and sometimes indented by a slight furrow running nearly parallel with the margin to the ligamental area, which is very gently curved: *beaks* small and pointed, not projecting, slightly recurved, placed so close together as to touch, and considerably nearer to the anterior side: *lunule* deep, abruptly defined by the edges of the anterior margin: *corselet*, or ligamental area, also deep and well defined: *ligament* very long and straight, horncolour, sunk within the dorsal margin, but visible outside, with the exception of a small portion on the sides, which is overlapped by a thin layer of shell: *hinge-line* representing an obtuse angle, and occupying much more than one-third of the circumference: *hinge-plate* rather broad and strong: *teeth*, in the right valve one triangular and pointed cardinal, and on each side of it a ridge-like lateral which is raised at the end; in the left valve two cardinals, one of which is much smaller than the other, the laterals being less distinct than in the other valve: *inside* nacreous and partly iridescent, salmoncoloured in the centre; margin bevelled off and plain: *scars* large and distinct. L. 0·85. B. 1.

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* Prickly.

Var. *minor*. Shell smaller and flatter, with stronger and more regular ridges.

Habitat: A muddy and gravelly bottom, from 8 to 90 fathoms, on nearly all our coasts, but locally distributed. It is much more common in the west of Scotland and Ireland than it is on the southern coasts of England. Captain Beechey dredged it in 145 fathoms off the Mull of Galloway. The variety occurs in deep water off Shetland; and there is a remarkable coincidence in size between it and the southern specimens. The geographical range of *L. spinifera* extends from Nordland to the Ægean and Canary Isles. It occurs in the upper miocene tertiaries of the South of France.

Scotch and Irish specimens are far larger than those from the south of England and the Mediterranean. Young shells are exquisite objects, with their snow-white complexion, occasionally suffused with a pale orange tint, and their delicate flounces almost equalling the ornamentation of the once-prized *Venus Dione*. The fry are quite smooth and glossy.

This constituted the type of Turton's genus *Myrtea*, and of Leach's genus *Cyrachæa*. It is the *Venus hiatelloides* of Delle Chiaje; and Philippi at first adopted that specific name, not being aware that the species had been long previously described by Montagu. Macgillivray considered it to be only the young of *L. borealis*; but it may be readily distinguished from that shell by its shape, which is triangular instead of circular, by its beaks being much less prominent, and by the row of sharp spines on the dorsal margin.

2. L. BOREA'LIS [*], Linné.

Venus borealis, Linn. Syst. Nat. p. 1134. *L. borealis*, F. & H. ii. p. 46, pl. xxxv. f. 5, and (animal) pl. M. f. 6.

Body clear white: *mantle* open from the anterior adductor to near the posterior muscle, where it is contracted and nearly closed: *labial palps* one on each side of the mouth, short, coarse, thick, nearly cylindrical, and striated: *foot* placed in the middle of the ventral area, very narrow, and lancet-shaped at the extremity.

Shell roundish, more or less tumid, solid and opaque, of a dull chalky hue: *sculpture*, numerous concentric ridges or ribs, which are not much raised although tolerably sharp; they become closer, irregular, and even confluent towards the front margin in adult specimens, and are somewhat laminar towards the posterior margin; the only other markings appear to be a few slight and minute concentric lines between the ridges: *colour* white: *epidermis* rather thick, fibrous, puckered, and light yellowish-brown: *margins* obliquely truncate on the anterior side, and forming nearly a right angle with the dorsal margin in consequence of the line from the beaks along the lunule being almost straight, rounded in front, with a slight tendency to obliquity, and somewhat truncate on the posterior side, which is indented by an indistinct furrow running nearly parallel with the ligamental area: *beaks* very small and pointed, rather prominent, much recurved, almost contiguous, considerably nearer to the anterior side: *lunule* deep and excavated: *corselet* level: *ligament* very long and straight, yellowish-brown, semicylindrical, slightly projecting outside; its sides are covered by a shelly strip, which is usually found broken in small pieces by the action of closing the valves: *hinge-line* curved, occupying not quite one-third of the circumference: *hinge-plate* broad and thick: *teeth,* in the right valve two strong cardinals, the anterior one being double, and the posterior much smaller and set more obliquely, and on each side of the beak a plate-like lateral, the anterior one being slightly raised at the end, and the posterior much longer than the other; in the left valve two similar cardinals, but nearly of equal height, and corresponding laterals: *inside* chalky-white, but in places irregularly tubercular from an internal deposit of nacre: *margins* bevelled off and plain, sometimes grooved longitudinally: *scars* remarkably large and distinct. L. 1·4. B. 1·5.

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[*] Northern.

Var. 1. *depressa.* Shell flatter and thinner, with fewer ribs and the beaks less prominent.

Var. 2. *gibba.* Shell much smaller, with a more oblique outline, the valves protuberant, ribs closer together, epidermis iridescent, and the beaks more prominent. L. 0·45. B. 0·5.

Habitat: On all our coasts, in muddy gravel and sand, from the low-water mark of spring tides to 82 fathoms. Captain Beechey has dredged it off the Mull of Galloway in 110–145 fathoms. The late Wm. Thompson and R. Ball found it in lakes of brackish water at Arran. Dr. Lukis informed me that this species was comparatively rare in the Channel Isles, and that the numerical proportion which it bore there to *Loripes lacteus* was as 1 to 50. He added, "*Lucina borealis* was wrongly stated by Forbes and Hanley (vol. ii. p. 48) to occur 'abundantly near St. Peter's Port in Guernsey.' We do not meet with it excepting at Herm. I have never found a single specimen on the Guernsey coast, although I have digged much in nearly every bay." He suspected that *Loripes lacteus* (single valves of which are exceedingly plentiful near St. Peter's Port, Guernsey) must have been mistaken for the present species. Var. 1. Many places, in deep water. Var. 2. In shallow water, Guernsey and Scalloway (J. G. J.); Bantry Bay (Norman). This species occurs in the tertiary beds of the Clyde (Geikie), Belfast (Hyndman and Grainger), Sussex (Godwin-Austen), and the Mammalian, Red, and Coralline Crag (S. Wood). Abroad it ranges from Iceland (Steenstrup) to Messina (Sars). Brocchi and Philippi enumerate it as an Italian fossil. I have found it in the upper miocene tertiaries of the South of France, as well as in the Uddevalla and Christiania beds. Gould describes it as a Massachusetts shell, and Stimpson from the Boston coast; but the latter now denies that it is our species, and distinguishes it by the greater size, by the ribs being more distant and regular, and by the colour, which Gould says is white: Stimpson has therefore named it *filosa*. However, if the claim to distinction rests only on these comparative characters, I do not see any reason for separating the Atlantic and Transatlantic species.

Montagu states that this shell is "particularly abundant at Falmouth, amongst the sand dredged from the harbour for the purpose of manure; by which means it is common in the arable fields about that place." I hope geologists may not be misled, and consider it fossil, if they find it in such situations. They need as much caution as antiquaries in the exercise of their pursuit, although they are not so liable to be wilfully deceived. It may be worth while to fabricate coins, flint knives, and similar relics of historic and prehistoric times; but fossil shells have no such marketable value, they are not so easily forged or imitated, nor would even

Palissy's workmanship impose on a palæontologist of any experience. The shell of *L. borealis* has a considerable tendency to vary in respect of the remoteness or proximity of the striæ. In some Guernsey specimens the ribs nearly disappear towards the front. A specimen from Exmouth has a minute pearl lodged between the pallial impression and the inner margin. The young are obliquely triangular, and marked with a few irregular white streaks which radiate from the beaks. The fry are almost globular, perfectly smooth, and glossy. Specimens of an extraordinary size are got at Tenby. My son picked up a single valve on the sands there, measuring two inches in breadth and nearly as much in length.

Petiver first noticed this species as British, and called it the "thread-girdled white Cockle." Donovan recognized it as the *Venus borealis* of Linné. It is also the *V. spuria* of Gmelin (from the figures of Lister and Chemnitz), *Tellina radula* of Montagu, and *Venus circinnata* of Brocchi. The type of Turton's *Lucina alba* is composed of two odd and much-worn valves of *L. borealis*. The *L. lactea* and *L. leucoma* of Macgillivray also belong to the present species.

Genus III. AXI'NUS *, J. Sowerby. Pl. V. f. 6.

Body convex: *mantle* having the margin thickened, without tubes: *gills* two on each side, an outer and inner pair: *foot* nearly cylindrical and very slender.

Shell globular, with somewhat of a triangular outline, smooth; posterior side longitudinally furrowed, or angulated: *beaks* much recurved: *lunule* short and sometimes indistinct: *ligament* usually and to a certain extent external, placed in a groove or excavation on the hinge-line, and outside the hinge-plate: *teeth* altogether wanting.

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* Hatchet-shaped.

If *Lucina* has been properly made the type of a separate family, and is no longer to be regarded as a genus containing many sections or subgenera, the validity of the present genus can hardly be questioned. A comparison of the characters above given with those of *Lucina*, as now sought to be restricted, will, I think, suffice to convince most conchologists that *Axinus* is a good genus. Those who are of opinion that the family has no substantial or natural basis are of course at liberty to adopt the old genus *Lucina* in its original integrity. I do not propose any new genus. *Axinus* has already attained the respectable age of forty years. It is at present in some danger of being set aside as obsolete or unfashionable; but

> Multa renascentur quæ jam cedidere, cadentque
> Quæ nunc sunt in honore vocabula, si volet usus,
> Quem penes arbitrium est et jus et norma loquendi.

These mollusks are of small size, and dwellers in mud and sand at various depths of water. The species are by no means numerous. Three of them are British and European, and another is Cuban. Mr. Searles Wood says, "Species strictly belonging to this genus have not been described from any formation of an older date than the tertiaries: the shell called *Axinus obscurus*, from the Magnesian limestone, belongs to a different group, and has already been made a genus of by Professor King, under the name of *Schizodus*." The shell of *Axinus* has no tooth. What has been taken for such is merely the point of the hinge-plate, near the beak, which becomes thickened, and even projects a little, in full-grown specimens. This process is unlike the tooth of any bivalve. The connexion of the valves depends wholly on the ligament, and is therefore slight. Sowerby, in proposing the present genus, instanced *A. angulatus* of the London Clay as the type. This exhibits all the essential generic characters, except in respect of the hinge, which is not visible in consequence of the matrix in which the shell is imbedded being too hard and compact to be removed. It is remarkable, however, that Sowerby added to his description of *Axinus*, "I suspect it has no teeth."

Several names for this genus have been attributed to Leach, viz. *Thyasira*, *Thiatira*, *Thiatisa*, and *Bequania*. The first only is classically correct. Turton called it *Cryptodon*, Philippi *Ptychina*, and I gave another generic name (*Clausina*) to one of the species. All these are mere synonyms and superfluous.

I would recommend those of my readers who are acquainted with the Danish language to read a very interesting account by Professor Sars of the animal of *A. Sarsii*, contained in his Report of a zoological excursion to the Loffoden Isles and Finmark in 1849. He observes that *Axinus* differs from all other Conchifera in the position of its generative organs, which lie *outside* the stomach, and not within it; and he compares this genus to the Brachiopoda in that respect. He found by a microscopical examination that some individuals were male and others female.

1. AXINUS FLEXUO'SUS *, Montagu.

Tellina flexuosa, Mont. Test. Brit. p. 72. *Lucina flexuosa*, F. & H. ii. p. 54, pl. xxxv. f. 4.

BODY clear white: *mantle* somewhat contracted on the posterior side, so as to form a round hole: *gills* thick, of a red-brown colour: *foot* placed in the middle of the ventral area.

SHELL roundish-oval, tumid, thin, usually opaque but sometimes more or less transparent, scarcely glossy: *sculpture*, irregular lines of growth and microscopical frost-like markings: *colour* white: *epidermis* filmy and inconspicuous: *margins* obliquely truncate on the anterior side, and forming nearly a right angle with the dorsal margin, which is almost straight or slightly incurved, rounded in front, and flexuous on the posterior side, which is deeply indented by a wide furrow or groove running from the beaks at an angle of about 30 degrees and gradually enlarging outwards, as well as by another smaller and parallel furrow close to the ligamental area: *beaks* small and pointed, but not prominent, much recurved, almost contiguous, a little nearer to the anterior side: *lunule* rather deep and heartshaped: *corselet* prominent, well defined by the upper furrow, and forming two sharp and pouting lips: *ligament* rather long, yellowish-brown or light horncolour, not projecting beyond the lips of the corselet, but distinctly visible outside; ligamental groove narrow and shallow: *hinge-line* obtusely angular, occupying not one-fourth of the circumference: *hinge-plate* rather broad and thick, nearly flat, almost all of it lying on the posterior side; immediately below the beaks it is indented in the right valve and slightly reflected in the left, which gives that valve the appearance of having an indistinct or obscure cardinal tooth: *inside* highly glossy and iridescent, sometimes slightly striated lengthwise; margin thin and plain: *pallial scar* broken in a zigzag line, in consequence probably of a corresponding structure in the edge of the mantle: *muscular scars* large. L. 0·375. B. 0·35.

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* Flexuous.

Var. *polygona*. Rather longer in proportion to the breadth, marked by three or four longitudinal ridges, giving the shell an angular form, the grooves on the posterior side being much deeper than usual.

Monstr. Having a longitudinal groove down the middle, which is longer and deeper in the left valve than in the right.

HABITAT: Gregarious in soft mud and sand on all the British coasts, from Shetland to the Channel Isles, in 3–87 fathoms. The variety is from the deepest water on the "outer haf," about forty miles east of the Whalsey Skerries, and the monstrosity from Falmouth and Tenby. This species is rather plentiful in the "alluvial" deposits at Belfast (Hyndman and Grainger); Clyde beds (Smith); Coralline Crag, Sutton (S. Wood).

It is widely distributed through the North Atlantic from Spitzbergen (Torell) to the Canary Isles (M'Andrew), and likewise through the Mediterranean and Ægean. The greatest bathymetrical limit recorded is that by Danielssen, viz. 180 fathoms, at Vadsö in Finmark. "Postglacial" beds in the Christiania diocese (Sars). Gould has described it as a Massachusetts shell; but in a review of his work by Philippi, in the 'Zeitschrift' for 1846, the North-American species is stated to differ in several respects from ours, and the name *Lucina Gouldii* was therefore given to it. Mörch refers the Greenland shell to this last species, and says it is the *Tyatira hyalina* of Beck. I confess that I have not been able to make out anything more than a varietal difference between the Greenland specimens and those of *A. flexuosus* from our own seas.

Young shells are globular, and the principal fold on the posterior side is visible in every stage of growth. The liver is of a beautiful purple colour. The attachment of the ligament to the hinge is slight, which accounts for single valves being so frequently thrown up on the shore, or taken by the dredge in sandy bays.

Lamarck described this species in his 'Histoire naturelle des Animaux sans Vertèbres,' both as *Amphidesma flexuosa* and *Lucina sinuata.* It is the *Cryptodon bisinuatum* of S. Wood's Catalogue, and the *Ptychina biplicata* (afterwards changed to *Axinus sinuatus*) of Philippi. The *Venus sinuosa* of Pennant and Donovan (thus characterized, "Thin, convex, a deep obtuse sinus or bending *in the front*") appears to be *Thracia distorta,* which is often contracted in this way; and Donovan's figure confirms that idea. S. Wood, however, considered it identical with the present species. The *A. Sarsii* of Philippi, described by Lovén in his admirable 'Index

Molluscorum litora Scandinaviæ occidentalia habitantium,' is not uncommon on the coasts of Norway and Sweden; but it has not been found in our seas. I venture to regard it as a large variety of *A. flexuosus*. Some remarks will be found on the subject when I come to treat of the next species.

2. A. CROULINENSIS *, Jeffreys.

Clausina Croulinensis, Jeffr. in Ann. Nat. Hist. vol. xx. p. 19; ser. 3. ii. p. 122, pl. v. f. 2, *a–c* (young).

SHELL obliquely oval, tumid, of a moderate thickness, opaque except in the young state, rather glossy: *sculpture*, numerous and fine but irregular concentric striæ: *colour* white: *epidermis* slight: *margins* rounded on the anterior side, as well as in front, and slightly angular on the posterior side, which is indented by a double but short furrow: *beaks* small and prominent, much more recurved than in the last species, almost contiguous and central: *lunule* indistinct: *corselet* narrow but well defined by the upper furrow: *ligament* slight, not visible outside; ligamental groove sloping inwards: *hinge-line* obtusely curved, occupying not one-fifth of the circumference: *hinge-plate* rather narrow but thick, almost all of it lying on the posterior side; the tooth-like folds are as in *A. flexuosus*, but very much stronger and more conspicuous: *inside* highly glossy, iridescent, and smooth; margin thin and plain: *pallial scar* indistinct: *muscular scars* oval. L. 0·15. B. 0·135.

HABITAT: Skye and Shetland, in muddy sand, from 45 to 85 fathoms; rare.

This shell, compared with specimens of *A. flexuosus* of a similar size and age, is longer and more oblique, as well as proportionally more solid; the margin of the anterior side is curved, instead of being nearly straight and truncate; the furrows on the posterior side are scarcely visible when viewed in front; the beaks are much more recurved; and the tooth-like folds are stronger and more prominent. I at one time thought it might be the young of *A. Sarsii*; but having been favoured by my kind friends in the North with a series of specimens from several localities, I am enabled to express a positive conviction that my shells are not the young of that species or variety. The shell of *A. Sarsii* in all states of growth is even more globular than *A. flexuosus*, the furrows are equally strong (except in large specimens, when they are less conspicuous), and the tooth-like folds are wanting or indistinct. *A. Sarsii* is usually found in deeper water than *A. flexuosus*, and I am not aware that both forms have ever been taken together. Asbjörnsen gives different localities for each on the coast of Norway; and Malm informs me that on the Swedish coast he always finds *A. flexuosus* on softer ground and in shallower water than the other. *A. Sarsii* attains a much larger size; and Lilljeborg showed me a comparatively gigantic specimen, which was upwards of an inch long. It occurs in the Uddevalla beds. The authors of the 'British Mollusca' inadvertently placed *A. Croulinensis* with *A. ferruginosus*. The outline of each will be sufficient to distinguish them, independently of other characters. The shell of the former is obliquely oval, and that of the latter almost globular.

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* From its having been first found near Croulin Island, in the Hebrides.

3.' A. FERRUGINO'SUS*, Forbes.

Kellia ferruginosa, Forbes, Ægean Invert., Brit. Assoc. Rep. 1843, p. 192.
Lucina ferruginosa, F. & H. ii. p. 60, pl. xxxiv. f. 1.

SHELL nearly globular, but more tumid towards the beaks, covered with a thick ferruginous crust or coating like the rust of old iron, beneath which it is thin, opaque, and rather glossy:

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* Covered with iron-rust.

sculpture, irregular lines of growth and intermediate microscopical striæ: *colour* reddish-brown outside, and milk-white inside the crust: *epidermis* thin and obscured by the outer covering: *margins* rounded on the anterior side and in front, obliquely truncate or sloping on the posterior side, which is slightly flexuous and marked by a broad but shallow furrow radiating from the beak, as in the last species: *beaks* small and tubercular, rather prominent, much recurved, not so close together as in *A. flexuosus*, and nearer to the anterior side: *lunule* imperfectly defined: *corselet* indistinct: *ligament* short, reddish-brown, sunk within the lips of the corselet and hardly visible outside; ligamental groove very slight and narrow: *hinge-line* obtusely angular, deeply excavated in the centre on the posterior side of the beak, and occupying about one-third of the circumference: *hinge-plate* narrow and sharp, reflected and projecting below the beak on the anterior side, so that the edge appears like a blunt cardinal tooth; by far the greater part of the hinge-plate lies on the posterior side: *inside* rather glossy; margin plain: *pallial scar* slight, entire: *muscular scars* conspicuous and round. L. 0·125. B. 0·125.

HABITAT: Muddy ground and sand in 30–50 fathoms, Sound of Skye; 20–100 fathoms, Loch Fyne; and 70–80 fathoms, off the west coast of Shetland. Close to Croulin Island, in the first of these localities, it is remarkably plentiful. Captain Hoskyn has lately taken specimens off the west coast of Ireland at a depth of 210 fathoms. Glacial beds, Aberdeenshire (Jamieson); Coralline Crag, Sutton (S. Wood). Torell has dredged it in 250 fathoms off the coast of Greenland; Lovén and other writers have mentioned it in their lists as Scandinavian, from Finmark to Bohuslän; and Forbes first described it, as inhabiting the Ægean at a depth of 119 fathoms.

The young are oval and transparent. Some specimens of a larger size than usual have a snout-like process which projects from the angle of the posterior side, and is caused by an excessive accumulation of the ferruginous crust in that part. This induces me to think that the coating arises from a deposit of fæcal matter in still and deep water, and not from any peculiar secretion of the animal, or from a mineral or chemical deposit.

It is the *Cryptodon rotundatum* of Searles Wood's 'Catalogue of the Crag Mollusca.' Judging from an examination of a single valve so named by Forbes, his *Kellia abyssicola* from the Ægean appears to be only the decorticated state of the present species.

Genus IV. DIPLODONTA *, Brown. Pl. V. f. 7.

Body nearly globular, but compressed: *mantle* thick, having a plain margin: *tubes* none: *gills* two on each side: *labial palps* the same: *foot* lancet-shaped.

Shell squarish, convex, and smooth: *beaks* not much recurved: *lunule* inconspicuous: *ligament* quite external: *teeth*, two cardinals in each valve, the anterior of which in the right valve is simple, and the other bifid or cloven, the contrary being the case in the left valve; laterals laminar and indistinct.

The peculiarity of this genus consists in there being two separate gills and as many labial palps on each side, instead of a single gill and palp as in all the other genera of the same family, and also of the ligament being altogether external, and the cardinal teeth more numerous and symmetrical. In adult specimens the anterior muscular impression is elongated, like that of *Lucina*.

The *Diplodontæ* inhabit every part of the marine world; and many fossil species have been described. Torell has lately dredged at Spitzbergen a new species, which is nearly allied to the only one we have in the British seas.

It is the genus *Mysia* of Leach, and (according to Woodward) *Sphærella* of Conrad.

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* Double-tooth.

Diplodonta rotunda'ta *, Montagu.

Tellina rotundata, Mont. Test. Brit. p. 71, tab. 2. f. 3. *D. rotundata*, F. & H. ii. p. 66, pl. xxxv. f. 6, and (animal) pl. M. f. 7.

Body clear white: *gills* laminar, somewhat elongated and angular, folded or puckered at the edges, pectinated, and fixed as usual to the dorsal range, the upper plate being little more than half the depth of the lower one: *palps* short, pointed, pectinated, and somewhat triangular: *orifice* at the posterior end very small and inconspicuous: *foot* central, rather long, and conical, minutely perforated at the point.

Shell obliquely quadrilateral, gibbous, not very thin, opaque, moderately glossy: *sculpture*, strongly marked and irregular lines of growth, and (under the microscope) exceedingly fine and close-set, regular longitudinal lines on the umbonal area, which radiate from the beak and are only perceptible in fresh specimens, as well as equally fine and numerous, but irregular and often wavy or confluent, transverse lines on the rest of the surface: *colour* milk-white: *epidermis* fibrous and yellowish, usually rubbed off except in front: *margins* obtusely angular on the anterior side, where the slope to the beak and front is nearly equal, obliquely rounded in front, somewhat produced and very much broader on the posterior side, which is also rounded at the end, and straight behind: *beaks* small, scarcely projecting beyond the dorsal line, and not contiguous: *lunule* very small, but deep, not well defined, and hidden by the beaks: *ligament* short, semicylindrical, yellowish-brown or of a golden hue, projecting beyond the dorsal margin; ligamental groove rather deeply cut: *hinge-line* slightly curved, occupying nearly one-third of the circumference: *hinge-plate* broad in the middle and tapering gradually to each end; the posterior side is the longer: *teeth*, in the right valve two erect cardinals, the posterior of which is double and placed more obliquely than the other, as well as a plate-like lateral on each side, the anterior of which is distinct; in the left valve the same number and kind of cardinals and laterals, but the position of the former is reversed: *inside* marked by slight longitudinal lines, frost-like in the centre and at the back, but glossy towards the margin, which is plain: *pallial scar* distinct, broad, and entire: *muscular scars* large and well marked, the anterior one irregularly elliptical, and the posterior oval. L. 0·9. B. 1.

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* Rounded.

Habitat: Not uncommon on the southern coasts of England and in the Channel Isles, and also in the south and west of Ireland, in 12–20 fathoms, sandy mud. Being elsewhere local, I may mention that it has been taken by Forbes and M'Andrew in 7–25 fathoms off Lundy Island, by Lyons at Tenby, by myself in 20 fathoms at Fishguard, and by M'Andrew in 12 fathoms off Anglesea. Sir W. C. Trevelyan and the Rev. G. C. Abbes are reported to have found it at Seaton and Whitburn; but Alder suspects these specimens were "derived from ballast." Possibly *Lucinopsis undata* may have been mistaken for it. The present species is a Coralline Crag fossil. Its foreign distribution is altogether southern, viz. Vannes (Mittré); Nice (Risso); Sicily (Philippi); Ægean (Forbes); Madeira and the Canary Isles (M'Andrew).

I have a distorted specimen, which is so much contracted in the middle as to look like a kidney bean. Occasionally the anterior side is much shorter than usual, making the shell decidedly inequilateral. Young shells are flatter; and the fry are triangular also, and in fact so different in shape that I described and figured it in the 'Annals of Natural History' for January 1858 as a distinct species under the name of *Diodonta Barleei*. The portly and protuberant form of the adult, compared with the slim figure of the young, reminds one of

. . . . "the Justice
In fair round belly with good capon lined."

Good living will doubtless tell upon the *Diplodonta*, as well as upon his Worship.

This species is the *D. dilatata* of Philippi and *Glocomene Montaguana* of Leach.

Family X. CARDITIDÆ, Gray.

Body oblong or roundish-oval: *mantle* thin, open in front, and folded behind into a short excretal tube: *foot* tongue-shaped and extensile, byssiferous.

Shell shaped like the animal, equivalve, inequilateral: *ligament* external: *hinge* strong, furnished with one or two cardinal teeth, which are set more or less obliquely, and with a laminar posterior lateral tooth in each valve: *pallial scar* in nearly every case entire: *muscular scars* large, round, and deep.

I give this family provisionally as British, not knowing where else to place the abnormal genus *Cyamium*, as well as a species of *Cypricardia*, which at present I am not sure is indigenous. The present members of this family are dispersed over the ocean, but chiefly confined to the southern zone: their ancestors flourished in the northern hemisphere, and multiplied exceedingly during the tertiary epoch.

With respect to the shape of the pallial scar, being the impression produced by the adhesion of the mantle to the inside of the shell near the front margin, I think an undue importance has been attached to this character. When it is sinuous or indented, it certainly shows that the animal has two distinct tubes springing from a common sheath, at the posterior side; but when it is simple, or even flexuous, we cannot learn from it whether there are two such tubes, or only one, nor what their length may be, nor even whether there is any tube at all. *Cardium* and *Venus* have each a double tube on the posterior side; but the pallial scar in the former is simple or entire, and in the latter sinuous.

Genus CYA'MIUM *, Philippi. Pl. V. f. 8.

Body somewhat compressed: *excurrent tube* scarcely projecting beyond the posterior side of the shell: *gills* large: *foot* slender.

Shell oblong, very inequilateral: *teeth*, in the right valve one strong and large double cardinal (appearing like two single teeth in immature specimens), and in the left valve two cardinals; each valve has an indistinct lateral tooth on the posterior side.

The type of this genus is a small shell from the Falkland Isles, which Philippi described in 1845 as *Cyamium antarcticum*. This is the only species known, unless the British shell which I am about to mention belongs to the same genus. The ligament in both species is *external*. Lovén adopted Philippi's genus for our shell, which has a wide European range; but he did so with some doubt, because it was supposed that the ligament in *Cyamium* was *internal*. Forbes and Hanley seem also to have entertained the latter idea; and they consequently proposed a new genus, *Turtonia*, for the reception of the northern species. Messrs. H. and A. Adams, in their most useful and elaborate work, 'The Genera of recent Mollusca,' at first united *Turtonia* with *Cyamium*; but in the appendix they expressed a different opinion, and separated them, on the ground that "the shell of the former is closed at both ends, the ligament is more exposed than in *Cyamium*, and it is also provided with slightly prominent elongated lateral teeth which are absent in *Cyamium*." Having several times examined minutely a series of specimens of *C. antarcticum* in the British and Stockholm Museums, I have arrived at a different conclusion; and, after carefully weighing the reasons stated by the able systematists above-named, I feel satisfied that the two species from the extremities of the Atlantic Ocean ought to be included in the same genus. Perfect specimens of *C. antarcticum* are closed at both ends; and the ligament is as much exposed, and the lateral teeth are as fully developed, in that species as in the other.

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* A little bean.

There is, however, a much greater difficulty as to the position and relations of this anomalous genus, in consequence of the following description of *Turtonia* in the 'British Mollusca' (vol. ii. p. 80): "Animal with the mantle widely open anteriorly, a single very slender siphonal tube at the shorter end, and an ample and strong foot angulated at its posterior base proceeding from the longer." The authors also state in the description of the species, "all we know of the animal is contained in the generic character, due to the observations of Mr. Alder." The representation of the animal, given in pl. O. f. 1. of that work, corresponds with the above description. In the 'Supplementary Notes on the Acephala' (vol. ii. p. 375), and in the description of the plates (vol. i. p. 480), a material error is noticed as to the engraving, viz. in the "siphon projecting from the short, instead of the long, end of the shell." The description remains uncorrected. Mr. J. de C. Sowerby assured me that he accurately made the engraving from a sketch furnished by the late Professor Forbes, whose name as the draughtsman appears on the plate. I thereupon wrote to Mr. Alder for further information; and in reply he says, "I am quite certain of *Turtonia minuta* (the species in question) having a small slender siphonal tube, which is occasionally exserted, but at the *longer* end. I have hunted out my sketches of the animal, which after some search I have found in an old memorandum-book of 1838, and herewith send you a tracing of them. You will see that in two of the figures the tube is exserted : but the animal is rather shy in extending it, and it can only be seen by watching the opportunity. It is probably the anal siphon, as is supposed to be the case in *Lucina* [*Loripes*],—the branchial siphon being either very short or only formed by a fold in the open mantle, as in some other genera." I have myself failed to detect any slender tube such as Mr. Alder has described, although during the last two years I have examined a great number of living and active individuals on the spot and under extremely favourable circumstances. Subjoined is the result of my observations, which were noted at the time of their being made, with respect to the shape and position of the tube and foot. The excretal or anal tube is small, button-shaped, and almost sessile. It is situate on the upper part of the posterior or broader side of the shell. This process is formed out of a fold or contraction of the mantle, and slightly separated by a raised edge from the long ventral opening. It is occasionally protruded, but never to a greater extent than the one-hundredth part of an inch. When this takes place the lower side is higher than the upper, and appears, when viewed sideways, like an exceedingly minute tooth or conical point. Being nearly transparent, the raised edges cannot be seen, unless the object is placed in relief on a black ground. The mouth or orifice of the tube is roundish-oval and plain. I repeatedly observed excretal pellets ejected from it. No other tube or orifice was perceptible on the same side. The ventral gape, occupying the middle of the open valves, is very large and wide. It serves for the admission of food, as well as of water to aërate the gills. There was always a current passing into it, charged with animalcula. The edges of the mantle towards the posterior side project or "pout" a little. The foot is slender, remarkably flexible, and extensile. It often assumes a cylindrical shape, especially when the animal is creeping, being dilated with water through an opening at the base or heel. It is nearly as long as the shell is broad, and is sometimes thrust out on the anterior side, so as to resemble a tube or siphon, as represented in Forbes and Hanley's plate. The figures given in the present volume were taken from the life by Dr. Saxby, and are perfectly accurate in every particular.

The European species of *Cyamium* lives between tide-marks, and literally swarms in some places. It attaches itself to seaweeds and other objects by means of a fine but tenacious byssus. Although it is minute (barely a tenth of an inch from one end to the other) it did not escape the keen eye of the great Otho Fabricius, who described it with his wonted accuracy upwards of eighty years ago. No species has been recognized in a fossil state. The *Cyamium? eximium* of Searles Wood appears to belong to another genus.

CYAMIUM MINU'TUM *, Fabricius.

Venus minuta, Fabr. Faun. Grœnl. p. 412. *Turtonia minuta*, F. & H. ii. p. 81, pl. xviii. f. 7 & 7A, and (animal) pl. O. f. 1.

BODY gelatinous, greyish-white with a faint tinge of purple: *tube* almost sessile: *foot* very flexible.

SHELL rhomboidal, or inclined to triangular in consequence of the prominence of the beaks, convex, rather thin, semi-transparent and glossy: *sculpture*, irregular lines of growth, and fine but not close-set intermediate striæ: *colour* purplish-brown, varying in intensity, and sometimes very pale, especially in front: *epidermis* only observable in bleached specimens: *margins* rounded on the anterior side, with an oblique slope to the front, which has a long and gentle curve, wedge-shaped at the posterior angle, and gradually and slightly curved on the dorsal side; umbonal area prominent: *beaks* blunt and calyciform, not much recurved, almost contiguous, and often eroded; they are placed very excentrically, being close to the anterior side: *ligament* cylindrical, horncolour, extending from the beaks towards the posterior or longer side, and rising above the level of the dorsal line: *hinge-line* obtusely angular: *hinge-plate* narrow, occupying rather more than one-third of the circumference: *teeth*, in the right valve one extremely thick and blunt cardinal, which is often bifid or trifid; in the left valve two erect and recurved cardinals; all these teeth are in adult specimens deeply and beautifully tinged with purple, and project from under the beaks; laterals hardly distinguishable from the hinge-plate and apparently forming part of it: *inside* glossy, but not nacreous: *pallial scar* entire: *muscular scars* distinct; the posterior is the larger of the two. L. 0·07. B. 0·09.

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* Minute.

HABITAT: Gregarious among seaweeds and under stones at low-water mark, and in the laminarian zone, on sheltered parts of our coasts from Unst to Alderney. Mr. Grainger has noticed it in the so-called "alluvial" deposit at Belfast. This species has a high northern range, but its southern distribution is limited. Fabricius, Möller, Mörch, and Torell found it in Greenland, and the last-named conchologist (as well as Steenstrup) in Iceland; Lovén and others have recorded it from the Scandinavian coasts, Récluz and Macé from Cherbourg, and myself from the Gulf of Spezzia. Stimpson says that it lives in Massachusetts Bay, "abundantly in June, about the roots of fuci, which cover the boulders at Point Shirley."

According to Fabricius this tiny shell has a Greenlandic name, "Ipiksaunarak." On certain parts of our coast it occurs in countless multitudes. Mr. Hyndman estimated that 35,000 shells were contained in the stomach of a single mullet caught in Larne Lough, where I have noticed them covering the leaves and stalks of

Zostera marina. I have also seen them at Balta clustering in vast profusion round the base of the pegtop-shaped plants of *Himanthalia lorea,* or the common strapweed; and my friend Mr. Norman brought me one day a small hand-net nearly full of them, which he had captured by sweeping the seaweeds at low water on the Whalsey Skerries. There must have been millions in this heap. The animal is a fearless or hardy little creature, and very active. When put into a saucer of sea-water, it immediately stretched out its white and slender foot, attaching the point to the surface of the vessel, and walked about with tolerable rapidity. I have observed it in a rock-pool, after having thus shifted its quarters, drawing in the foot and mooring itself to a stone, or leaf of a seaweed, by its strong but almost transparent byssus. Under a microscope the gills may be seen through the shell, when it is of a lighter colour and therefore more transparent than usual, to flap like those of a fish. It swims freely in an inverted position, the beaks of the shell downwards, and the point of the foot expanded. The motion of swimming seems to be effected by a series of muscular contractions parallel with the line of progress, the point only of the foot being so employed. The gills are then distinctly visible through the open folds of the mantle, and consist of two pairs; the outer pair are rather larger and higher than the inner pair. The mantle appears to have two folds, the inside one being the smaller. When the animal is creeping, the foot is folded inwards for its whole length. It is then filled with water through a wide and open slit in the heel or base, and becomes of a tubular or cylindrical shape. Several individuals being confined in the same vessel, after restlessly and actively moving about for some time, assembled in groups, young and old, and continued in a torpid or quiescent state even after they had been provided with a fresh supply of water. In this state, however, the shells were partly open, and the *Cyamia* were still feeding. The fry are enveloped in irregularly oval gelatinous masses, each containing from 12 to 20 individuals. These spawn-masses are deposited on extraneous substances; so that the animal is not viviparous. The fry are found in various stages of development; but in every state the shells are perfectly formed and can be seen through the transparent envelope.

Fleming, in his 'British Animals,' seems to have mistaken this species for *Lasæa rubra*. It is the *Mya purpurea* of Montagu. Brown placed it in the genus *Saxicava*, Deshayes in *Chione*, and Möller in *Lesæa*.

In some shell-sand dredged for Dr. Lukis at about 20 fathoms, on the east coast of Guernsey, and within two miles of the land, I found not only a living *Cardium papillosum* and other rarities, but also a young and perfect specimen of *Cardita lithophagella* of Lamarck. It is the *Byssomya Guerinii* of Payraudeau, and is not very uncommon in the Mediterranean. In all probability it belongs to the genus *Cypricardia*. Lamarck, in describing this genus, says that it has three cardinal teeth and one lateral, and that *Cardita* has only one cardinal and one lateral tooth. But the present species has two cardinal teeth, and one posterior lateral tooth, in each valve, besides an anterior lateral in the left valve. The pallial scar is deeply sinuous or indented at the posterior side, and the muscular scars are of enormous size. In these respects it would come nearer to *Venerirupis*. The 'Journal de Conchyliologie' for 1850 has an able article by M. Mittré on this species, in which, however, he erroneously considered it to be the *Cypri-*

cardia coralliophaga of Lamarck, a native of the West-Indian seas, which burrows in corals and madrepores. The usual habitat of *C. lithophagella* is in crevices of rocks; but the irregular and often distorted shape of the shell induces me to believe that it does not perforate them. Young shells are not much unlike *Cyamium minutum* of a comparatively large size, and are nearly of the same colour; but they are flatter, and the hinge-process and scars are quite different. It is possible that Montagu may have described the young of *C. lithophagella* under the name of *Donax rubra,* which he said was very rare and had been taken "amongst coralline in deep water." The *D. rubra* of Turton is the fry of *D. trunculus.* I hope this notice may induce conchologists to search for *C. lithophagella* on our southern coasts, and especially in the Channel Isles.

Family XI. CARDIIDÆ, Broderip.

Body globular or roundish-oval: *mantle* widely open in front, and forming two short and usually contiguous tubes at the posterior or larger end: *gills* two on each side, unequal: *foot* very large and conical, much bent in the middle: *byssus* rarely produced.

Shell equivalve, ventricose, with a triangular outline, generally somewhat equilateral, sculptured by longitudinally radiating ribs or striæ, and in most cases also with concentric plates or foliations, which form spines, tubercles, or vaulted scales; umbonal area prominent: *ligament* quite external, placed on the posterior side, and in some cases continued under the beaks to the other side: *hinge* short but thick, furnished with one or two rather small but strong and conical cardinal teeth in each valve, besides lateral teeth, but the latter are sometimes wanting or inconspicuous: *pallial scar* entire: *muscular scars* oval and distinct.

We are now in smooth water, and not sorry to have escaped from the troubled sea and short broken waves, which lately hindered our passage and made it so difficult and unpleasant. The present group is free from all those anomalies that rendered the position and arrangement of many genera in the last two families extremely critical and indefinite, taxing the discriminative powers of the systematist to an extent which makes conchological nature almost faint under the task. The Cockles are easily characterized and cannot be well confounded with any other family.

Although the mantle-scar is usually entire, Mr. Clark has observed that "in some species an imperfect pallial siphonal sinus may be seen." I have in vain searched for such a mark. According to Dr. Carpenter the microscopical structure of these shells is very much the same as in the *Arca* family. He says that in various species of *Cardium*, which he had examined, he found "a considerable amount of tubular structure in the external layer, while in *Isocardia* there is scarcely a vestige of it—thus bearing out the general statement that the presence of the tubular structure has a relation to the costations, foliations, or other sculpturing of the external surface."

Cockles inhabit sandy and soft ground; and they are widely distributed over all seas, from low-water mark to considerable depths.

We have only the typical genus: the others (*Cardissa, Papyridia,* and *Aphrodita*) are tropical and arctic forms.

Genus CAR'DIUM*, Linné. Pl. V. f. 9.

Body globose: *mantle* thin at the edges and tubercled behind, very slightly adhering to the shell: *tubes* unequal in size, but nearly of the same length, covered with cirri or filaments: *gills* short; upper pair smaller than the lower: *palps* triangular: *foot* sickle-shaped.

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* Heart-shaped.

SHELL convex, closed in nearly every case: *beaks* bent inwards, but scarcely (if at all) to one side: *teeth*, in the right valve usually two cardinals, besides two laterals on the anterior side and one on the posterior side; sockets deep: *inside* more or less fluted, and having the margin notched.

This genus is redolent of the good old times. It carries with it a smack of true conservatism—progressive improvement without innovation. Every sound conchologist must rejoice at seeing the name of *Cardium* still preserved, with a few others, and to know that they have survived the extensive and often injudicious changes which systematists have been continually proposing since the death of the much-honoured Swede. Some corrections and modifications of his scheme of classification were required by the progress of science, and they have been made. With regard to our own molluscan fauna, *C. corneum, C. lacustre, C. amnicum, C. rubrum, C. discors,* and *C. arcuatum* of Montagu have been placed in very different families, and a few species have lately been added to the British list. But the genus has a solid foundation, and is likely to last as long as conchology itself.

Its large and fleshy foot is admirably adapted for penetrating and burrowing into sand. The mode by which this operation is effected has been well described by Réaumur. He says that when the animal wishes to sink, it lengthens its arm [or foot], and at the same time attenuates the extremity of it, which thus becomes almost pointed. With this it makes a hole, like a gardener using his dibble, and buries the arm in the sand, continuing the perforation with the pointed end; and by repeatedly lengthening and contracting this muscular organ, it in a short time works the shell below the surface. When, on the contrary, the animal would return to the light, it is only necessary to expand and press its arm firmly against the sand, and the shell will rise in proportion to the power exerted from beneath, and will soon be disengaged. By this means the cockle is also enabled to move both forwards and backwards, but in a very limited degree. So far Réaumur. I may also observe that the sand in which it lives is always more or less saturated or infiltrated with water, and sometimes is even semifluid, making it much easier for the cockle to work its way than if it had to penetrate a harder mass. The foot is very elastic; and the prodigious leaps which the animal makes with it have been noticed by many writers on popular science: Mr. Gosse gives an amusing account of the feats which his "Signor tuberculato" (*C. tuberculatum*) performed in this way. The ridge-and-furrow sculpture is very regular, and by means of this alternate arrangement each valve locks closely into the other. Owing to the adductor muscles being but slightly attached to the shell, the animal immediately becomes loose when put into boiling or scalding water. Collectors therefore experience no trouble in cleaning the inside of any cockle-shell. For this reason also live cockles are much more easily opened than oysters, the latter operation being rather an arduous undertaking to a bungling tyro. They may have served to illustrate the proverb mentioned by Hesiod—*κόγχην διελεῖν*—signifying any slight task.

Very many species of *Cardium* occur in a fossil state. Mr. Searles Wood says, "Species possessing undoubted characters of this genus have been obtained from the middle secondary formations, and they are largely developed in the tertiaries, while from the present seas not less than 200 species have been obtained."

It is much more difficult to reconcile the synonymy of our native species than to distinguish them. As Lovén has justly remarked, " Cardia europæa misere confusa." I will endeavour not to increase this perplexity, without disregarding, however, the established rules of priority and general usage.

The meaning of the generic name (heart-shaped) will appear when the united valves are viewed in profile. The genus *Cerastes* was formed by Poli for the animal.

A. Shell more or less globular; ribs strong, and covered with spines, tubercles, or vaulted scales.

This section may be further subdivided into

a. Round. 1. *C. aculeatum*. 2. *C. echinatum*. 3. *C. tuberculatum*. 4. *C. papillosum*.

b. Triangular. 5. *C. exiguum*. 6. *C. fasciatum*. 7. *C. nodosum*. 8. *C. edule*.

c. Longitudinally oval. 9. *C. minimum*.

1. CARDIUM ACULEA′TUM *, Linné.

C. aculeatum, Linn. Syst. Nat. p. 1122; F. & H. ii. p. 4, pl. xxxiii. f. 1.

BODY of a vermilion colour: *foot* long and awl-shaped.

SHELL very gibbous, with a somewhat oblique outline, thin for its size, opaque and rather glossy: *sculpture*, 20–22 strong compressed ribs, which are a little broader than the furrows between them; each rib is divided in the middle by a ridge of spines, which bend towards the posterior side, being longer and double on that part and tubercular on the anterior side; the furrows are transversely striated, or in aged specimens are marked with flexuous wrinkles; in younger shells there are a few irregular longitudinal lines, giving the furrows an appearance of being partially decussated; the ribs are also striated transversely, but less distinctly than the furrows; the whole surface is covered with frost-like microscopical markings: *colour* yellowish with a reddish tinge: *epidermis* fibrous, only observable near the margins, having been removed in other parts by continual attrition: *margins* rounded on the anterior side, and sloping with an oblique curve in front to the posterior side, which is produced, much broader than the other side, truncate, and exhibits a long and narrow but distinct gape extending from the edge of the hinge-line to the angle where it joins the ventral margin: *beaks* almost touching each other; umbones tumid: *ligament* cylindrical and thick, resembling the chrysalis of a large fly, prominent, reddish-brown: *hinge-line* obtusely angular: *hinge-plate* folded back towards the beaks, occupying scarcely one-third of the circumference: *teeth,* in the right valve two erect cardinals, besides two laterals on the anterior and one on the posterior side; in the left valve two similar cardinals, the posterior of which is very much smaller than the other, besides one lateral on each side: all the lateral teeth are triangular and pointed: *inside* rather glossy, fluted towards the front and anterior margins, the concavities corresponding with the outside ribs; the under side of the furrows is flat: *pallial scar* broad and entire: *muscular scars* about equal in breadth, but the anterior one is the longer. L. 3·2. B. 3·35.

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* Thorny.

HABITAT: Not uncommon on the South-Devon coasts, especially at Paignton near Torbay, but scarcely ever found in a living state; Weymouth (Thompson); Guernsey (Lukis); Dublin Bay (Brown); Point of Ayre, Isle of Man (E. Forbes); Hebrides and Orkneys (Pennant). These last two localities, as well as the next, are very doubtful. Mr. James Smith says, on the authority of the late Dr. Landsborough, that it occurs in the glacial deposit at Stevenston. Sars has dredged a fine specimen near Bergen; De Gerville, Collard des Cherres, and Macé have recorded the species as inhabiting the North of France; and many other authors have described or enumerated it as Mediterranean. It may on the whole be considered a southern form.

Young specimens are globular and not angular; and they are sometimes marked with concentric zones of a paler colour than the rest of the shell, denoting the lines of growth. This state is the *C. spinosum* of J. Sowerby. *C. ciliare* of Montagu represents an earlier stage of growth: Linné's species of that name is very different. Turton noticed and figured in his 'Conchylia Dithyra' (p. 181, tab. 13. f. 7) a distorted shell, obliquely twisted to the posterior side which is more elongated or produced than usual. The cardinal teeth in this specimen are equal in size, tubercular, and slightly cloven; there is a third cardinal in the right valve, and the laterals are very short. Linné supposed that the present species was perhaps a variety of *C. echinatum*; but the latter is much smaller, more solid, and never angular, and it has shorter prickles. The posterior gape, also, in *C. aculeatum* is very considerable, while in *C. echinatum* it is scarcely perceptible.

2. C. ECHINA'TUM *, Linné.

C. echinatum, Linn. Syst. Nat. p. 1122; F. & H. ii. p. 7, pl. xxxiii. f. 2, and (animal) pl. N. f. 3.

BODY somewhat compressed, varying in colour from yellowish-white to a rich pink: *mantle* open for three-fourths of its circumference, having a plain and thin margin (which in the young is dentate or notched) about a line in breadth, behind which it is suddenly thickened, and at regular intervals raised into a series of glandular warts or tubercles, corresponding with the grooves inside the shell: *tubes* contiguous, each encircled with a fringe of white cirri or tentacular processes, which have at their base a corresponding row of yellow, brown, or red points; the outside of the tubes is also clothed with some scattered and coarse white pendulous filaments; the excurrent tube is rather the shorter and smaller of the two, and its orifice is provided with a globular valve, which is occasionally protruded: *mouth* very large and funnel-shaped: *gills* semioval; the upper pair are as long as the lower, but not half the depth: *palps* very long, slender and pointed, strongly striated on the inside and less so on the outside: *foot* finger-shaped, closely striated lengthwise, covered with a flesh-coloured or vermilion delicate skin, under which it is pure white; its length is at least twice that of the shell.

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* Prickly.

SHELL roundish, very convex, rather solid, opaque and of a dull hue: *sculpture*, about 20 strong but somewhat compressed ribs, which are a trifle broader than the furrows between them; the crest of each rib has a numerous row of triangular and short but stout spines, which are connected together at the base and are usually curved towards the posterior side; all these spines are nearly equal in diameter and length; both ribs and furrows (especially the latter) are crossed by flexuous wrinkles, which are coarser and more distinct on the posterior side; in young specimens are observable some longitudinal lines and microscopical markings similar to those noticed in the description of the last species: *colour* yellowish-white: *epidermis* fibrous, mostly obliterated: *margins* rounded on the anterior side, and sloping to the front, which is curved, but much less obliquely than in *C. aculeatum*; posterior side not much produced, although considerably broader than the other, slightly truncate, and exhibiting a narrow and indistinct gape: *beaks* more or less contiguous; umbones tumid; below the beaks on the anterior side is a nearly smooth heart-shaped space, the lips of which project or pout, especially on the upper part: *ligament* shaped like that of the last species, brownish-horncolour: *hinge-line* obtusely curved: *hinge-plate* reflected, occupying about one-third of the circumference: *teeth*, in each valve two erect nearly equal-sized cardinals, with laterals similar to those of the other species: *inside* and *scars* the same. L. 2·2. B. 2·3.

Var. 1. *expansa*. Shell rather more depressed and spread out at each end.

Var. 2. *ovata*. Shell transversely oval; ribs sharp, obliquely radiating, and much narrower than the furrows; transverse striæ fewer than in typical specimens of a similar size; dorsal margin nearly straight; there is only a single minute cardinal tooth in each valve, besides indistinct laterals. L. 0·125. B. 0·15.

HABITAT: All our sandy coasts, at various depths from 5 to 100 fathoms. It occurs in almost every newer pliocene deposit from the Belfast bed (Grainger) to the Caithness boulder-clay (Peach), and also in the Red Crag. Var. 1. Exmouth Ullapool and Lerwick (J. G. J.); Dublin Bay (Warren). Var. 2. Barmouth and Shetland (J. G. J.); Inverary (M'Nab). The last variety resembles in many respects the *C. elegantulum* of Möller, and the *C. strigilliferum*, a Coralline Crag shell. In two of my specimens some of the spines are vaulted as in *C. elegantulum*. That species inhabits Greenland, Iceland, and Finmark. The geographical range of *C. echinatum* is very extensive. Fabricius has recorded it from Greenland, Landt from the Faroe Isles, Lovén and others from Scandinavia, De Gerville and others from the North of France, Risso and others from the Mediterranean, Chiereghini from the Adriatic, Forbes from the Ægean, and M'Andrew from Vigo, Madeira, and the Canaries.

O. F. Müller says that the animal seems to be little else than a huge foot. The coloured points, which stud the orifices of the tubes (and also, according to the last-named author, the margin of the mantle), may be analogous to the "eyes" of a scallop. The largest British specimens I have measure a trifle more than two inches and three quarters in length. Those from the south of Europe are much smaller. Sometimes the shell is partially coated with a ferruginous deposit.

This common species was first described by Rondeletius as "Concha echinata;" and although the specific name was accompanied by expletives, and is pre-Linnean, it has survived the changes consequent on the institution of the binomial system. The young is the *Cardium ciliare* of Pennant, *C. parvum* of Da Costa, and *C. spatula* of Solander.

3. C. TUBERCULA'TUM *, Linné.

C. tuberculatum, Linn. Syst. Nat. p. 1124. *C. rusticum*, F. & H. ii. p. 11. pl. xxxi. f. 3, 4.

BODY reddish-yellow: *mantle* thickened and notched on the posterior side: *tubes* fringed with cirri: *foot* long and of a crimson colour.

SHELL resembling that of *C. echinatum*; but it is larger, and much more globular and solid; the *sculpture* is coarser, and there are 21 or 22 ribs; the spines are more like tubercles, those on the anterior side being spatulate, or flat and transversely triangular, while those in front and on the posterior side are very short and bluntly conical: *colour* yellowish-brown with a tinge of red, often disposed in beautifully variegated zones or bands: *margins* in front remarkably contracted or pinched in, so as greatly to increase the convexity of the shell. It does not differ in other particulars from *C. echinatum*. L. 2·9. B. 3·2.

HABITAT: Cornwall, Devon, and Dorset, in sandy bays, from low water at spring tides to 12 fathoms; Guernsey (Lukis); Bantry Bay (Humphreys). Leach says, "abundantly in the Firths of Forth and Clyde, Yawl [Youghal], Bantry, Cork, and Dingle Bays, Ireland;" but I fear he has confounded this species with *C. echinatum*. Newer pliocene, Worcestershire (J. Smith); Sussex tertiaries (Godwin-Austen). It has not been recorded from any place north of Great Britain; but its range southward extends from Finistère to Vigo, Madeira, and the Canary Isles, as well as throughout the Mediterranean as far as Sicily.

Young shells are very pretty. They are invariably coloured like the adult, the ribs are covered with white calyciform tubercles, and the transverse markings form near the beaks a fine and regular lattice-work. A single valve in Dr. Turton's collection is obliquely elongated at the posterior extremity, showing that the same kind of monstrosity occurs in different species which agree in general structure.

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* Covered with tubercles.

In the present instance I have omitted some of the characters, believing that a comparison between this species and the last would be sufficient. The two are very similar. Such a strong family likeness runs through all the Cockles, and indeed through every other equally homogeneous group, that some may think it superfluous to repeat the same particulars in describing each species. But nothing is more difficult, and often more unsatisfactory, than to compress the description within narrow limits. In attempting to seize the salient points, others which perhaps are not less material are liable to remain unnoticed. "Dum brevis esse laboro, obscurus fio." More harm to science has been done by a slight and consequently vague diagnosis than by a too great prolixity of detail.

This species may be the *C. rusticum* of Linné; but there is equal probability that it is his *C. tuberculatum*, which is of prior date. The latter name only is given in his descriptive Catalogue of the Museum of Queen Louisa Ulrica; and the comparison there made between the present species and *C. echinatum* is full and conclusive. Even in the 'Systema Naturæ,' which contains a description of all three species, *C. tuberculatum* is placed next but one to *C. echinatum*, and *C. rusticum* follows *C. edule*, which is separated from the first by eight other species. I have observed a similar order of sequence in the present work, as I consider it a great help to classification, and that this method of associating or bringing together species closely allied to each other enables the student to distinguish them more readily than if they were arranged indiscriminately and without regard to their natural connexion. The characters assigned by Linné to *C. tuberculatum* ("sulcis obtusis nodosis transversim striatis") are more applicable to our shell than those by which *C. rusticum* is described, viz. "sulcis xx remotis interstitiis rugosis." For the above reasons, and because every writer on European or British conchology, except Poli in the last century and Forbes and Hanley of late years, has applied the name of *rusticum* to a variety of *C. edule,* it would seem undesirable to reject the well-known and appropriate name of *tuberculatum.* I may also observe that Mr. Hanley, in his Supplement to Wood's 'Index Testaceologicus' (the publication of which was completed in 1856), regarded the *C. rusticum* of Linné as "probably a variety of *edule.*" The *C. ciliare* of Donovan (but not of Linné) and *C. nodosum* of Montagu (but not of Turton) are the young of the present species.

4. C. PAPILLO'SUM*, Poli.

C. papillosum, Poli, Test. utr. Sicil. ii. p. 56, t. xvi. f. 2–4.

SHELL very gibbous and nearly globular, with a somewhat oblique outline, solid and opaque, glossy: *sculpture,* 25 or 26 flattened ribs, with very narrow furrows or interstices between them; each rib is furnished with a series of white tubercles, which are conical and more or less incurved on the posterior side, smaller in the middle, and bluntly triangular or calyciform on the anterior side; the furrows are crossed and indented by numerous regular, narrow slits or punctures: *colour* yellowish, sometimes variegated by reddish-brown streaks or bands, especially on the posterior side: *epidermis* fibrous and rather coarse, light yellowish-brown, only observable in the furrows: *margins* rounded on the anterior side, with an oblique slope to the front, which is also curved, and obtusely truncate on the posterior side, which is expanded and twice the breadth of the other side; a blunt and indistinct angle runs from the beak to the lower part of the posterior margin; there is no perceptible gape: *beaks* very small, not contiguous, slightly inclining to the anterior side; beneath them on this side is a false lunule or smooth lozenge-shaped space with slightly prominent lips: *ligament* cylindrical, yellowish-brown with a golden hue: *hinge-line* curved: *hinge-plate* reflected, occupying about one-fourth of the circumference: *teeth*, in the right valve two triangular cardinals, the posterior of which is much larger and higher than the other, besides two short anterior laterals also of unequal size, and one triangular and projecting posterior lateral; in the left valve two cardinals, the anterior of which is the larger, besides a single lateral on each side, the anterior one being triangular and projecting: *inside* bright and glossy, sometimes stained with purple or reddish-brown towards the beaks and on the posterior side, fluted near the margin only: *pallial scar* indistinct: *muscular scars* large, roundish-oval, and equal-sized. L. 0·55. B. 0·6.

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* Covered with papillæ.

Var. *lactea*. Shell milk-white.

Habitat: In gravelly sand, at 15–20 fathoms, off Guernsey and Sark, as well as thrown up on the beach at Herm (Lukis and J. G. J.). It is at present one of our most scarce shells, although I have a series from not much larger than half a line to the full size. I shall not be surprised if it is found on the Cornish coast. Its exotic range is entirely southern. No writer on the conchology of the North of France appears to have noticed it. It inhabits every part of the Mediterranean, and also the Ægean, as well as the Atlantic from Vigo to the Canary Isles, at various depths from 6 to 75 fathoms.

The appearance of punctures in this and the following three species arises from the ribs being crowded or squeezed together, so as to prevent the free development of the interstitial striæ.

The late Dr. Lukis discovered the interesting and remarkable species now described, to be an inhabitant of our seas; and he most liberally sent me the finest of the first two specimens which he found. Both were living when taken by the dredge. I cannot resist the opportunity of acknowledging my gratitude for the valuable aid and communications which I continually received from this kind friend for many years and up to the time of his lamented and premature death. His gifted mind, varied acquirements, generous nature, and great amiability fascinated all who had the good fortune to know him. He was a true naturalist. These and collectors are too frequently classed together; but there is an essential difference between them. The former loves science for its own sake, and not for the childish pleasure of acquiring many rare species or even a unique specimen. He is never selfish or covetous, his only craving being for the sympathy of others who have the same tastes as himself. The mere collector is generally not so intellectual or estimable. Dr. Lukis exemplified this difference. The feelings that prompted him to share the discovery above-mentioned with a brother naturalist were doubtless the same as those expressed by the most philosophic of our modern poets in the following lines:—

> "Often have I sighed to measure
> By myself a lonely pleasure,
> Sighed to think, I read a book
> Only read, perhaps, by me."

May such characters never be wanting in our land!

C. papillosum is the *C. scobinatum* of Lamarck, *C. planatum* of Renier, and *C. Polii* of Payraudeau. The last-named author said that another species of *Cardium* (*C. echinatum*), having papillæ, was known before Poli described the present species as *papillosum*; but this hardly seems a sufficient reason for changing the name. The young is *C. punctatum* of Brocchi, but not of Philippi.

5. C. EXI′GUUM *, Gmelin.

C. exiguum, Linn. Syst. Nat. (ed. Gmel.) p. 3255. *C. pygmæum*, F. & H. ii. p. 29, pl. xxxii. f. 8, and (animal) pl. N. f. 2.

BODY triangular and much truncated at the posterior side, yellowish-white: *mantle* plain-edged in front, and fringed with numerous white filaments about the bases of the siphonal tubes: *incurrent* (or branchial) *tube* the larger of the two, and surrounded by a border of about ten filaments, with as many or more tawny streaks radiating from it; there is also a tinge of tawny or orange around the orifice of the smaller or *excurrent tube*; both are nearly sessile: *foot* long, cylindrical, and large in proportion to the body; its base is tinged with tawny, the rest being white.

SHELL obliquely triangular, exceedingly gibbous, solid and opaque, usually of a dull hue, and never so glossy as that of the last species: *sculpture*, 20 or 21 ribs, which are at first sharp and angular but afterwards become compressed and broad, especially in front; the ribs are in young specimens more or less covered with small white tubercles, which are not formed in the adult except on the anterior side; the furrows, which are very narrow, are crossed and indented by numerous regular, oval punctures: *colour* yellowish or dirty-white, sometimes variegated by purplish-brown streaks or blotches, which are more visible on the posterior side, occasionally tinged with pink: *epidermis* fibrous and often thick, yellowish-brown of different shades: *margins* bluntly angular on all sides except in front, where there is a contraction similar to that in *C. tuberculatum*, causing this side to be very gently curved, and not so much rounded as in most other species; the angle or ridge separating the posterior side is very conspicuous and increases the gibbosity of the shell: *beaks* very small, not contiguous, inclining a little to the anterior side, and placed very much nearer to it; beneath them on this side is a deep and heart-shaped or lanceolate ribless depression, more like a lunule than the similar mark in any of the preceding species, and having slightly projecting lips: *ligament* short and sunken, cylindrical, yellowish-brown: *hinge-line* slightly curved: *hinge-plate* thick, reflected, occupying scarcely one-fourth of the circumference: *teeth*, in the right valve two cardinals, the posterior of which is much the larger, besides two anterior laterals of unequal size and one posterior lateral; in the left valve two cardinals, the anterior being much larger than the other, besides a single lateral on each side; all the lateral teeth, except the front anterior one in the right valve, are triangular, and, although short, project considerably: *inside* bright and glossy, occasionally iridescent, and sometimes of a yellow hue and more or less stained with purplish- or chocolate-brown in front and on the posterior side, fluted near the margin only: *pallial scar* indistinct: *muscular scars* oval, large, nearly equal-sized, and deeply impressed. L. 0·55. B. 0·55.

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* Little.

Var. *subquadrata*. Shell rhomboidal, in consequence of the posterior side being more expanded than usual and of the dorsal margin being quite straight; furrows slightly striated, instead of being punctured.

HABITAT: Oozy ground in the laminarian zone on most parts of our coasts, at from 3 to 15 fathoms. The variety is rare, and has only occurred to me at Scalloway in the mainland of Shetland, and at Sark, one of the Channel Isles. As an upper tertiary fossil this species has been noticed by Mr. Grainger at Belfast, by Mr. James Smith in the Clyde beds at Dalmuir and Bute, and by Mr. Godwin-Austen in the Sussex deposits. Finmark and Bergen (Sars); Sweden, 15–20 fathoms (Malm); Cherbourg and Granville (De Gerville); Vigo (M'Andrew); Gulf of Lyons (Martin); Algeria (Weinkauff); Corsica (Requien); Adriatic (Chiereghini); Sicily (Philippi); Ægean, 7–30 fathoms (Forbes); and Sebastopol in the Black Sea (Middendorff). Many intermediate localities have also been recorded by other authors.

Turton says that these shells are "sometimes imbedded in hard clay; and both Mrs. Griffiths and ourselves have taken them from the interior of the hardest stones in Torbay." They may have found their way into such places for the sake of shelter, but (like Sterne's starling) couldn't get out. Another habit, however, which this little cockle possesses, is more remarkable. In the 'Antologia di Scienze naturali,' published at Naples in 1841, Sr. Costa described and figured a shell under the name of *C. parasitum,* which appears to be a variety of *C. exiguum.* He observes that it attaches itself by means of a byssus to the boughs of trees laid down in the sea for the purpose of collecting oyster-spawn. A short account of these nurseries has been given in p. 46 of the present volume. Some interesting particulars of the embryogeny of *C. exiguum* will be found in the treatise of Professor Lovén on the development of the Acephala Lamellibranchiata, to which I have elsewhere referred. The decided angularity of the shell serves as an unfailing test to recognize this species, although (like its congeners) it is subject to considerable variation in respect of shape and colour. In the fry the dorsal margin is straight, making the outline more square than triangular.

Gmelin constituted this species from a figure in Lister's 'Historia Conchyliorum,' t. 317. f. 154 ("A. Pectunculus exiguus, subfuscus"), which unquestionably represents our shell. His own description is slight; but in adopting the name originally given by Lister he has been followed by all conchologists except Donovan and the authors of the 'British Mollusca,' who have called it *pygmæum.* Among other synonyms (for variatal forms) may be mentioned *C. subangulatum* of Scacchi, *C. Siculum* of Sowerby, *C. stellatum* of Reeve, and *C. aquilinum* of Mittré. *C. parvum* of Philippi appears to be also a variety, and *C. muricatulum* of Montagu (from Walker, pl. iii. f. 83, 84) the fry of the present species.

6. C. FASCIA'TUM*, Montagu.

C. fasciatum, Mont. Test. Brit. Suppl. p. 30; F. & H. ii. p. 25, pl. xxxii. f. 5, and (animal) pl. N. f. 4.

Body suborbicular, flake-white: *mantle* plain-edged: *tubes* usually not much produced, of the same length, and united, each encircled with ten simple white cirri, and fringed with longer filaments of the same colour: *gills* pale brown: *foot* long, narrow, subcylindrical, or finger-shaped, and (contrary to what it is in most other species of *Cardium*) hyaline.

Shell obliquely triangular, convex but not very gibbous, compressed towards the front, rather thin, but usually opaque, not glossy: *sculpture*, 25 or 26 ribs, which are remarkably flattened in front and compressed at each end of the shell; they are smooth in front, but are more or less covered on the anterior side with obliquely transverse blunt plates, and on the posterior side with short conical tubercles or prickles; furrows extremely narrow and slight, for the most part impressed with numerous and minute circular punctures: *colour* yellowish-white, with sometimes a tinge of red or pink near the beaks, and frequently variegated by interrupted reddish-brown bands, which are more conspicuous on the posterior side: *epidermis* very slight, fibrous, yellowish-brown: *margins* rounded on the anterior side, with an oblique slope to the front, which is also (but more bluntly) rounded, more or less elongated and wedge-shaped on the posterior side, with a blunt angle running from the beaks; on this side there is a greater or less degree of truncature; dorsal margin short: *beaks* very small, not contiguous, inclining towards the anterior side, but not so excentrically placed as in *C. exiguum*; beneath the beaks is a distinct but not deep lunule-shaped depression: *ligament* rather long, cylindrical, narrow, greenish-brown, occasionally continued on the anterior side: *hinge-line* curved: *hinge-plate* thin and narrow, slightly reflected, sometimes stained with purplish-brown, occupying not one-fourth of the circumference: *teeth* as in *C. exiguum*, but they are very much slighter: *inside* glossy, frequently of an orange colour in the middle and marked with reddish-brown streaks, fluted more than in many other species, by reason of the shell being thinner and the deposit from the mantle being more slight: *pallial scar* scarcely perceptible: *muscular scars* indistinct. L. 0·5. B. 0·5.

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* Marked with bands.

Var. 1. *globosa*. Shell more globular, the posterior side being less produced.

Var. 2. *alba*. Shell milk-white, of an intermediate shape between that of the typical kind and the first variety.

Habitat: Gravelly sand, in 5–90 fathoms, from Shetland to the Channel Isles, generally diffused and rather common. Var. 1. Shetland and west coast of Scotland. Var. 2. Off Unst in deep water, together with coloured specimens. In a fossil state this species occurs in the Clyde beds at Bute (Smith); Coralline Crag (J. G. J.). Its foreign range extends from Iceland (Steenstrup and Torell), Faroe Isles (Mörch), Norway and Sweden (Lovén, Sars, and others), Bay of Kiel (Meyer and Möbius), Zealand (Hællebæk), Cannes (Macé), Spezzia in 18 fathoms (J. G. J.), Gulf of Tunis, Malaga, and Canary Isles (M'Andrew), to the Azores (H. Drouet). In Finmark it acquires a comparatively enormous size. It is one of the Uddevalla fossils.

This shell is never sharply angular like *C. exiguum*, and it is of a much thinner substance. In the young the prickles are vaulted, and cover the ribs in the same way as brick tiles are set on the crest of a roof. The fry are almost flat, and have a square contour. They may be distinguished in this state from *C. exiguum* by having more ribs. Mr. Clark observed a specimen to be full of ova on the 4th of August.

Owing to the posterior side being more produced in some specimens than in others, Montagu seems to have made two species out of this one, viz. *C. elongatum* and *C. fasciatum*. The former represents the more usual or typical kind. I have a shell which was sent by Mr. Dillwyn to Col. Montagu for his opinion, and returned with the name "Car. fasciatum" in the handwriting of the latter on the cover of the small packet which still contains it. This specimen undoubtedly belongs to the present species; and Mr. Dillwyn was, I believe, as careful as I have endeavoured to be, in the conservation of such proofs of authenticity. Bruguière and Lamarck described a tropical species as *C. elongatum*: otherwise that name is more appropriate than *fasciatum* in respect of our shell. The *C. fasciatum* of Gmelin is different, having been derived from a figure of Knorr; but his species is obsolete. The late Mr. G. B. Sowerby proposed to change the name *fasciatum* to *ovale*, and Dr. Leach to that of *zonatum*. It is the *C. elongatum* of Turton and of most other writers on British conchology, *C. exiguum* of Macgillivray, and (in a younger state) probably *C. scabrum* of Philippi. It is also the *C. rubrum* and *C. arcuatum* of Reeve, who by his references to Montagu appears to have considered the present species identical with *Lasæa rubra* and *Loripes divaricatus*. His descriptions and figures were taken from shells in Mr. Cuming's collection.

7. C. NODO'SUM *, Turton.

C. nodosum, Turt. Conch. Dith. p. 186, tab. 13. f. 8; F. & H. ii. p. 22, pl. xxxii. f. 7.

BODY subglobose, of a whitish colour, and semitransparent: *mantle* edged with white pointed filaments, which correspond with the ribs of the shell: *tubes* very short, pale yellow, each having 10 or 12 flake-white cirri at the orifice, and red points at the base, besides longer and curved white filaments above, below, and on the sides of both tubes; from the excurrent tube protrudes a retractile valve: *gills* semioval, the upper not half the length or breadth of the lower ones: *palps* very small and triangular, pectinated more strongly above than below, like the gills: *foot* white, moderately long, subcylindrical, with a slight bend or elbow.

SHELL obtusely triangular, convex, gibbous near the beaks, and gradually compressed or sloping towards the front margin, solid and opaque, rather glossy: *sculpture*, 24–28 longitudinal ribs, which are rounded at the sides and somewhat depressed above; they are for the most part thickly covered either with small tubercles, or else with oval or arched plates, which are often spinous or prickly on the posterior side; furrows narrow and rather slight, usually impressed with numerous and minute oval punctures, and sometimes with obliquely transverse striæ: *colour* milk-white, with frequently a tinge of pale yellow or orange, and occasionally (but rarely) variegated by interrupted bands, blotches, or spots of chestnut: *epidermis* slight, fibrous, pale yellowish-brown: *margins* rounded in front and on both sides, but somewhat truncate and a little produced at the posterior end, with an obtuse and slight angle from the beak on that side; dorsal margin sloping at nearly the same angle on each side: *beaks* very small, not contiguous, inclining a trifle to the anterior side, but nearly central; the space below them is ribless and almost smooth, but not much depressed or well defined: *ligament* rather short, cylindrical, narrow, pale yellowish-brown, sometimes continued on the anterior side: *hinge-line* curved: *hinge-plate* of moderate thickness and breadth, reflected, more or less stained with brown or chocolate colour, occupying about one-fourth of the circumference: *teeth*, in the right valve one conical, and one smaller oblique laminar cardinal, and a strong triangular lateral on each side, besides occasionally a very small and indistinct second lateral on the anterior side; in the left valve two similar cardinals (but their position is reversed with respect to that of the teeth in the other valve), and a slighter lateral on each side: *inside* glossy, sometimes more or less stained with chestnut or chocolate, fluted or deeply notched on the margin only: *pallial scar* entire, but mostly slight and inconspicuous: *muscular scars* oval, posterior one the larger. L. 0·475. B. 0·5.

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* Covered with knots.

Var. 1. *ovata.* Shell more produced at each end and coarsely sculptured.

Var. 2. *rosea.* Shell tinged with a rosy or pink hue both outside and inside. *C. roseum*, Lam. An. sans Vert. vi. p. 14.

HABITAT: Locally diffused on various parts of the British and Irish coasts, at from 3 to 86 fathoms, in shelly gravel and sand. Capt. Beechey dredged it in

145 fathoms off the Mull of Galloway. At Guernsey it is gregarious in 15–20 fathoms. Var. 1. Hebrides and Shetland. Var. 2. Guernsey, 18 fathoms. The typical form occurs, according to Searles Wood, in the Red and Coralline Crag. Lovén and many others have recorded it as Scandinavian and inhabiting various depths from 3 to 100 fathoms; I have found it at Etretat in the North of France, as well as at Spezzia; near Cherbourg (Lamarck), Gulf of Lyons (Martin), Cannes (Macé), Sicily (Philippi), and Vigo (M'Andrew).

C. nodosum has probably been passed over as the young of the common cockle (*C. edule*); but that species is always more globular and produced in front, and has much smoother ribs and less distinct and prominent tubercles. The present species differs from *C. fasciatum* in being more solid, and usually of a milk-white colour; the ribs are more thickly covered with tubercles; the beaks are nearly central; and the posterior side is not obliquely produced, as in the last-mentioned species. Young shells have a somewhat square outline. The most brightly coloured specimens in my collection were found in Guernsey, Arran Isle (Galway), and Balta Sound. Southern specimens are more triangular than those from the north.

In strict justice this species ought to be called *roseum*, being the name given by Lamarck to the second variety, three years before Turton described his *C. nodosum*; but it is now generally known by the latter name, and the shell is rarely rosecolour. I before observed that Montagu's shell of the same name (to which Turton erroneously referred this species) is the young of *C. tuberculatum*. The *C. roseum* of Chemnitz is a *Cardissa*. *C. punctatum* of Philippi (but not of Brocchi) appears to be a variety of our species.

8. C. EDU'LE *, Linne.

C. edule, Linn. Syst. Nat. p. 1124; F. & H. ii. p. 15, pl. xxxii. f. 1–4, and (animal) pl. N. f. 5.

BODY subglobose, thick, opaque white: *mantle* pale yellow; edges fringed with short white filaments, corresponding with the ribs of the shell: *tubes* short, conical, separate at their bases and divergent, whitish, pale yellow, or reddish-brown, and sometimes speckled with black; the incurrent tube is larger than the other, and has its orifice encircled with 10 long white cirri, besides two or three shorter ones between each; the excurrent tube has a plain orifice, and is provided with a distinct retractile tubular valve; the orifice of each tube is bordered by a dark or red-brown line, and the sides of both are clothed with curly white filaments, as well as part of the mantle, as in other species of *Cardium*: *gills* suboval, pale brown, finely pectinated; upper pair much the smaller: *palps* longish, pointed, flat, somewhat triangular, red-brown, smooth on the outer and pectinated on the inner surface: *foot* long, and lancet-shaped at the point, proportionally smaller than in other species, varying in colour from opaque white to pale yellow or brown, often of a deeper hue towards the extremity.

SHELL triangularly rhomboidal, convex, deeper behind, somewhat compressed towards the margins, and especially at the sides, very solid and opaque, of a dull hue: *sculpture*, 24–28 flattish ribs, more or less crested with straight transverse plates, which are stronger and more developed at the sides; there are also some extremely fine and microscopical longitudinal and transverse striæ, which cover the whole surface, making it appear partially shagreened; furrows rather narrow and slight, without punctures: *colour* whitish, or yellowish, sometimes light reddish-brown, with a faint prismatic lustre, marked transversely in the young by zigzag and irregular streaks of purplish-brown: *epidermis* thin, fibrous, yellowish-brown, usually rubbed off except round the edges: *margins* gently curved but occasionally nearly straight in front, rounded on the anterior side, obliquely truncate and wedge-shaped on the posterior side; on the upper part of this side the margin forms an obtuse angle with the dorsal line, which slopes a little: *beaks* very small, contiguous and consequently often worn by the attrition, considerably incurved;

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* Edible.

umbones central: *lunule* slight and indistinct: *ligament* short but strong, horncolour, with sometimes a greenish tint, continued on the anterior side in large specimens: *hinge-line* gently curved: *hinge-plate* thick and rather broad, reflected on the posterior side, where it is usually stained with chocolate colour, occupying about one-third of the circumference: *teeth*, in the right valve one double cardinal, shaped like a reversed V, and set obliquely, and a strong but short double lateral on each side; inner teeth and laminæ much smaller and more sunk than those next to the hinge-line; in the left valve are similar cardinal and lateral teeth, having their relative size and position reversed, but these laterals are not so disproportionately small as those in the right valve: *inside* somewhat glossy and nacreous, deeply stained with purplish-brown on the posterior side, fluted towards the margin, which is armed with short spikes, corresponding with the outside furrows: *pallial scar* slight and wavy: *muscular scars* very strong, posterior one the longer. L. 1·6. B. 1·7.

Var. 1. *rustica*. Shell smaller and thinner, with the posterior side usually more produced and wedge-shaped: *colour* purplish-brown or light orange, often disposed in transverse rows. *C. rusticum*, Chemn. Conch. Cab. vi. p. 201 (referring to Linné's species of the same name), pl. 19. f. 197.

Var. 2. *crenulata*. Shell oval and more equilateral; front margin nearly straight. *C. crenulatum*, Lam. An. sans Vert. vi. p. 13.

HABITAT: Gregarious everywhere in our sandy bays, from low-water mark to a few fathoms. Var. 1. Estuaries of brackish water. Var. 2. Plymouth (Reeve); Herm (Lukis); Dogger Bank (Rich). This well-known species occurs in all our pliocene tertiaries from the latest raised beach to the Coralline Crag; and I have found it in upper miocene strata near Antibes. It is very generally distributed through the North Atlantic Ocean, from Iceland (Mohr) to the Ægean (Forbes). The variety *rustica* has also a range of similar extent; and, according to Middendorff, it inhabits the Aral Sea, Caspian, Black Sea, and Russian Lapland. Lamarck gives "La Manche" for the other variety; and I am inclined to refer to it also some fossil shells which the Rev. H. B. Tristram brought home from the Great Sahara and sent to Sir Charles Lyell.

The mode by which the cockle burrows in sand with its dibble-shaped foot (called by Paley "its stiff tongue") has been already described; but Mr. Dennis informs me of another habit, with which I was not before acquainted. He says, "I found a large specimen of the common cockle moored by a byssus to a stake in the mill-creek. It might be eighteen inches up the stake. The run of the water is very strong at the spot, and the bottom shingle." This confirms an observation of the same kind made by Costa with regard to a variety of *C. exiguum*, and which I have before noticed. Philippi expressed his disbelief of Costa's statement; but there is nothing wonderful in the cockle or any other animal acquiring a new habit under altered circumstances, especially if such habit is not inconsistent with its general organization. It may arise from the development of a mysterious faculty, closely allied to one which in our pride we call reason, and consider to be our own exclusive property. But boast not, O Man, of your superiority to other animals in this respect! Your and their Creator may, if he think fit, grant the same mental privileges as you enjoy to the brute, and even to the mollusk. See what Coleridge has to say on the subject:

> "And what if all of animated nature
> Be but organic harps diversely framed,
> That tremble into thought, as o'er them sweeps,
> Plastic and vast, one intellectual breeze,
> At once the soul of each, and God of all."

The shape of the cockle is extremely variable. In sheltered or still water, where the ground is muddy or soft, the shell is thinner, and the posterior side has a tendency to become elongated and more wedge-like than usual. In exposed and rough seas, where the ground is harder, the shell is thick and globular. In certain localities the inside is of a rich purple colour. The largest specimens I have seen came from Unst and Stornoway, and the next in size from Appledore in North Devon and the Scilly Isles. Some of these examples measure 2⅓ inches in breadth. Distortions are not unfrequently met with. The most remarkable are as follows:—inequivalve, the left valve being much smaller than the right, and nearly flat; divided into two lobes by a constriction in front; resembling a *Cardissa*, the anterior side being squeezed in and showing a large lunule; and one shell piled on another, and apparently growing out of it. Irregular pearls are occasionally formed. A specimen of *C. edule* in Mr. Norman's cabinet, found by Mr. Cocks at Falmouth, contains a massive secretion of this kind, which occupies nearly one-half of the inside. It proceeds from under the beak, and looks like a huge wen. The animal seems to have suffered no further inconvenience from the excrescence than being obliged to extend its shell in front, so as to make up for the space lost at the back. I have likewise a large button-shaped livercolour pearl which was taken from a common cockle in the act of being eaten at breakfast. Young shells are frequently round, or longer than broad, and are indistinctly angular on each side. In a still earlier stage of growth they are very prettily variegated, and liable to be mistaken for *C. fasciatum*; but they never have the oblique contour or the polished ribs of that species.

I hope I shall not be accused of undignified trifling, or of venting platitudes, if I say a little more about the variableness of the cockle-shell. No specimens are alike. I have amused myself at the seaside in looking over a basketful of them, with a view of finding two exactly similar; but I have never succeeded. They may be distinguished one from another, like men, sheep, or dogs. Ruskin has the following apposite remark, in his 'Modern Painters,' as to what he terms "the truths of nature." He says that they "are one eternal change—one infinite variety. There is no bush on the face of the globe like another bush: there are no two trees in the forest whose boughs bend into the same network, nor two leaves on the same tree which could not be told one from the other, nor two waves in the sea exactly alike." This is an eloquent and suggestive truth. Lucretius had long ago illustrated the same idea by instances drawn from the animal kingdom, in which he includes "concharumque genus."

The good qualities of this shell-fish as an article of food are notorious. The ancients appear to have been in the habit of roasting them, if we believe that they are the subject of one of Æsop's fables, in which the son of a husbandman thus apostrophizes some he cooked in this way, and which were fizzing in the fire: "O most wicked creatures, are you singing, while your houses are being burnt?" A schoolboy thinks the true moral of this fable ought to be, "add insult to injury," instead of "every thing in its season." Lister mentions that in his time cockles were eaten raw, as well as cooked; and Fleming and Macgillivray notice the same custom as prevalent in Scotland. They are also pickled like oysters, and a "vol-au-vent aux bucardes" is by no means a despicable "plat." Macé says that the Bretons call them "Coques," a name also applied to one or more species of *Tapes*. Cockle-gathering is a useful, though humble branch of our national industry, and gives an honest employment to thousands of women and children. In Surtees's 'History of Durham' it is stated that, besides the home consumption, about £300 is annually gained in Greatham alone by this occupation. Near the little village of Penclawdd in South Wales a busy and picturesque scene may be witnessed towards the end of autumn or in the early spring. When the tide is out, nearly all the female and juvenile population are engaged in raking the sands and collecting these shell-fish. The cockles are put into tubs and pans of fresh water to get rid of the "grit" or sand, and the next day they are boiled in large caldrons placed in the open air. The produce is then fished out with sieves, and after being well rinsed in clean water is carried to Swansea market in baskets poised on the heads of the cockle-women. Many a drawing in the Water-colour Exhibitions has been enlivened by the addition of a group thus equipped and crossing the sands at low water. Immense heaps of shells are accumulated in the above process of preparing cockles, and may hereafter give rise to as much speculation with regard to the antiquity of the race of cockle-gatherers, as the Danish and Scotch "kjökkenmoddings" do at the present time. The shells also are useful. In places near the sea-coast where ordinary lime is not to be had, or the carriage of it is expensive, there cannot be a better substitute than the lime which is made by calcining cockle-shells. An analysis by Dr. Phipson, a chemist of no mean repute, has shown that they contain more than 90 per cent. of pure carbonate of lime. They seem to have been converted into rude ornaments by our ancestors; and Wilson, in his 'Prehistoric Annals of Scotland,' describes a cist in which the only relics deposited beside the skeleton were a quantity of cockle-shells of different sizes, rubbed down until they were reduced nearly to rings.

An impudent hoax was played on the learned Wernerian Society in 1825 by a pretended "discovery of live cockles in peat-moss, at a great distance from the sea, and much above its present level." The name of the place where this phenomenon is said to have been observed was Cocklesbury near Greta Bridge, and some highly ingenious arguments were adduced to show how the cockles got into the moss, and contrived to exist for centuries out of their native element. It need scarcely be said that the writer of the article was imposed upon by a scientific wag. Other Scotchmen have been equally credulous. Buchanan relates a strange notion, which he had heard was prevalent in Barra, one of the Western Isles, that the cockle originates from a freshwater bivalve (probably a species of *Pisidium*) called the "seed" by the inhabitants, who supposed that it grew larger in the sea, after being carried down by the river.

According to Searles Wood, *C. edule* in its recent and fossil state has sixteen synonyms.

9. C. MI'NIMUM*, Philippi.

C. minimum, Phil. Moll. Sic. i. p. 51, and ii. p. 38, t. xiv. f. 18. *C. Suecicum*, F. & H. ii. p. 33, pl. xxxii. f. 6.

BODY of a gelatinous consistency and whitish colour.

SHELL roundish-oval, with an oblique outline, convex (especially behind), thin but nearly opaque, rather glossy: *sculpture*, 28–30 delicate and flattened longitudinal ribs, more or less covered throughout with minute crowded arched scales, which are sometimes arranged in a double row, giving a scabrous appearance to the surface; furrows rather narrow and slight, crossed by microscopical striæ, which are three times as numerous as the costal scales, and in younger and less perfect specimens resemble punctures: *colour* milk-white, with occasionally a very faint prismatic hue: *margins* rounded on all sides except behind, where there is a gradual slope towards the posterior end, which in the young is indistinctly angular: *beaks* very small, glossy, turning towards the anterior side: lunule-shaped depression rather long and deep: *ligament* short, yellowish-brown, projecting above the dorsal line: *hinge-line* curved: *hinge-plate* narrow and sharp, occupying between a third and a fourth of the circumference: *teeth*, in the right valve one double cardinal (the plates or lobes of which are of unequal size), with a short triangular lateral on the anterior side and a small sunken laminar lateral on the posterior side; in the left valve are corresponding cardinals and laterals, the latter on the anterior side being double: *inside* polished and slightly nacreous, fluted in every part, owing to the concavity of the outside ribs, the flutings having broad and truncate terminations: *scars* slight and usually indistinct. L. 0·4. B. 0·4.

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* Smallest.

HABITAT: Fine sand in 5–100 fathoms, west of Scotland and Moray Firth, Shetland, and all the Irish coasts; Mr. M'Andrew has dredged it sixty miles N.N.W. of the Land's End in 50 fathoms. It is a local species. According to Geikie it has been found by Mr. Richmond in the glacial deposits at Bute. It inhabits the seas of Scandinavia and the western coasts of the Baltic, at depths varying from 10 to 130 fathoms. Philippi discovered a recent single valve at Panormi, and many in a fossil state at Palermo and Tarenti; and M. Martin has taken it alive in the Gulf of Lyons.

Clark thought that this might be a variety of *C. edule*. It is, however, a much more delicate shell; its length is greater in proportion to its breadth, and its contour is more oblique; the transverse scales are arched or vaulted, instead of straight; the interstices of the ribs are minutely striated or punctured; and the inside is fluted throughout, and not towards the edge only, and the extremities of these internal grooves are truncate or blunt, being in *C. edule* sharply pointed.

It is the *C. Suediense* of Reeve, *C. Loveni* of Thompson, and *C. Suecicum* of Lovén.

B. Shell longitudinally oblong; ribs slight and smooth, absent at the sides.

10. C. Norve′gicum *, Spengler.

C. Norvegicum, Spengl. Skrivt. Naturh. Selsk. v. pt. 1. p. 42; F. & H. ii. p. 35, pl. xxxi. f. 1, 2, and (animal) pl. N. f. 1.

Body nearly oval, thick, yellowish-white: *mantle* flesh-colour or reddish-white; edges plain and white: *tubes* short, united at their base and divergent at the point of separation, pale yellow, marked with flake-white spots and lines; the incurrent tube is rather the shorter of the two, but wider, and it has its orifice encircled by about 20 yellowish-white cirri of different lengths, each having a dull red-brown line round its base; the excurrent tube has a plain orifice, with the usual retractile valve, which is marked on the upper and lower surface with a faint red-brown line, a few spots of the same colour surrounding the orifice of this tube; the sides of both tubes and the posterior side of the animal are clothed with thick-set pale reddish-brown and light-yellow curled filaments: *gills* suboval, pale brown, with the edges of a deeper hue, unequal-sized (as in the other species) but hanging more vertically: *palps* very long, triangular, more deeply striated on the outside than within: *foot* long and powerful, cylindrical, geniculate, pointed at the extremity, covered (except at the point) with a thin fleshcolour film, resembling shagreen in appearance, under which it is pure white. The colour of the different parts of the body varies in intensity and its relative hues, according to the age of the individual and the nature of the sea-bottom.

Shell longitudinally oval, with a triangular outline, moderately convex, sloping gradually towards the front and sides in a wedge-like form, slightly gaping at the posterior side, solid and opaque, silky but not shining: *sculpture*, 40–42 extremely faint ribs, which are quite flat and about as broad as the intermediate spaces; there are no ribs on the sides; the whole surface is crossed by remarkably crowded wavy striæ, not perceptible by the naked eye: *colour* yellowish-white, beautifully mottled in the young and near the beaks of the adult with blotches or longitudinal streaks of reddish-brown or fleshcolour: *epidermis* thin, consisting of a tissue of exceedingly numerous and delicate fibres, woven in a transverse direction, frequently anastomosing or becoming blended together, and varying in colour from yellow to brown: *margins* curved in front and at the sides, with a slight tendency to form an angle at the posterior extremity; the rounded contour is only interrupted behind by the prominence of the umbonal area: *beaks* small, almost touching each other, slightly recurved towards the anterior side: *lunule* indistinct, but having projecting lips: *ligament* long, spindle-shaped, horncolour, and continued under the beaks on the anterior side: *hinge-line* obtuse-angled: *hinge-plate* broad, reflected outwards, not occupying one-fourth of the circumference: *teeth*, in the right valve two cardinals, a strong triangular lateral on the anterior side and a smaller pointed lateral on the posterior side; in the left valve are also two cardinals, two laterals (the lower one being very much larger than the other) on the anterior side and one short triangular lateral on the posterior side; the cardinals are relatively of the same size in each valve: *inside* porcellanous, closely and microscopically striated like the epidermis, sometimes of a chocolate colour, or variegated with reddish-brown; margin fluted in the middle and towards the sides, but only notched near the hinge-line: *pallial scar* distinct: *muscular scars* oval and deep. L. 2·4. B. 2·3.

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* Norwegian.

Var. 1. *gibba*. Shell smaller, having a more oblique contour, and gibbous.

Var. 2. *rotunda*. Shell flatter and rounder.

Var. 3. *pallida*. Shell of a uniform strawcolour.

HABITAT: Generally, but locally, diffused throughout the British seas, on sandy and nullipore bottoms, in 5–80 fathoms. Var. 1. Exmouth (Clark); Swansea and Bantry Bay (J. G. J.); Milford Haven (Jordan). Var. 2. Birterbuy Bay, Connemara (Barlee). Var. 3. Exmouth (Clark); Sark (J. G. J.). This species is a member of our more recent pliocene beds, as well as of the Coralline Crag. Mr. Rose has found a specimen in a stratum at Breydon, near Great Yarmouth, containing what he considers "redeposited" Crag shells. Its foreign habitation comprises the Faroe Isles, Finmark, and all the intervening coasts to the Ægean, Madeira, and the Canaries.

Specimens which I dredged in Bantry Bay measure about 3 inches in length, and nearly as much in breadth. Single valves found by Sars in Christiansund are of the same dimensions; and some living specimens taken by Martin in the Gulf of Lyons are scarcely inferior in size. It is the "large high-beaked cockle" of Wallis, and the "smooth cockle" of Pennant.

This shell was for a long time considered by British authors to be the *C. lævigatum* of Linné; but his very short description in the Catalogue of the museum of Queen Louisa Ulrica (upon which that in the twelfth edition of the 'Systema Naturæ' was founded) states the colour as reddish spotted with white, a character inapplicable to the present species. No locality is given; and there are several allied species in the same section, any one of which might have been intended by Linné. Our shell was more probably his *C. serratum,* as well as Lamarck's species of that name. It would have been strange if Linné did not know this common shell. However, the name proposed by Spengler is now generally accepted. It is the *Pectunculus maximus* &c. of Lister, *C. crassum* of Gmelin, *C. oblongum* of Brown (but not of Chemnitz) as well as of Reeve, and also the *C. Pennantii* and *C. vitellinum* of the last-named writer. The *C. medium* of Turton (but not of Linné) is the fry of *C. Norvegicum,* judging from his typical specimen. The genus *Lævicardium* of Swainson represents this section of *Cardium,* the synonymy of which is sadly confused.

C. muricatum and *C. medium* of Linné, *C. citrinum* of W. Wood (*C. serratum*, Turton), and *C. Grœnlandicum* of Chemnitz (*C. edentulum*, Montagu, and *Mactra radiata*, Donovan) are not British, although they have been wrongly introduced into our fauna. The first three are tropical, and the last arctic. Dr. Fleming was mistaken in regarding the *C. nodosum* of Turton as the young of *C. muricatum*.

Family XII. CYPRI'NIDÆ, Geinitz.

Body globose or suborbicular: *mantle* open in front: *tubes* sessile or short: *gills* nearly equal in size: *foot* tongue-shaped, and adapted for burrowing in sand or mud.

Shell equivalve, globose or rounded, with a triangular outline, more or less equilateral, solid, concentrically striated or furrowed: *beaks* twisted spirally or turned to one side: *ligament* mostly external: *hinge* short but strong, furnished with two or three cardinal teeth, besides laterals, in each valve: *pallial scar* entire: *muscular scars* oval and usually very distinct.

This family holds a middle rank between the *Cardiidæ* and *Veneridæ*, but is more nearly allied to the latter. It differs from *Cardiidæ* principally in the shell not having the longitudinal ribs which characterize that family, and from *Veneridæ* in the tubes of the animal being sessile or short, and in the pallial scar being consequently entire at the posterior side. I am not quite satisfied, however, that it is a "good" family, except as regards the single genus *Isocardia*.

All the *Cyprinidæ* are inhabitants of sandy and muddy tracts of the sea-bed. They may, on the whole, be regarded as northern forms.

Genus I. ISOCAR'DIA *, Lamarck. Pl. VI. f. 1.

Body globose, small in proportion to the shell: *mantle* thin; edge double, but plain: *tubes* sessile; orifices papilliferous: *foot* broad, compressed, and triangular.

Shell heart-shaped when viewed sideways, smooth or concentrically striated: *epidermis* longitudinally ciliated: *beaks* separate, and involute or spirally twisted: *lunule* incomplete: *corselet* none: *ligament* wholly external, forked outwards on the anterior side, owing to the divergence of the beaks: *teeth*, in each valve two cardinals, placed obliquely, the outer one being laminar and curved, besides a single lateral on the posterior side.

The only species which we possess of this eccentric genus was placed by Linné in *Chama*, and by Bruguière in *Cardita*; Lamarck properly separated it from both, and it constitutes the type of his *Isocardia*. It may be known from *Cardita* by its convolute and twisted beaks, and from *Chama* by being both equivalve and free. Lamarck placed it at the end of the "Cardiacées," on account of its general resemblance to the Cockles. The globular and cordate form of the shell is very elegant. Carpenter says that the external layer has scarcely a vestige of the tubular structure which is so conspicuous in *Cardium*. The epidermis of the European *Isocardia* is much thicker than that of tropical species of the same genus. No species appears to have been found on the northern coasts of America. Poli called the animal *Glossus*.

Isocardia cor †, Linné.

Chama Cor. Linn. Syst. Nat. p. 1137. *I. cor*, F. & H. i. p. 472, pl. xxxiv. f. 2, and (animal) pl. N. f. 6.

Body soft, yellowish-white: *mantle* completely lining the shell; margin of an orange colour: *tubes* rather wide at their orifices: *gills* free, concealed between the mantle and the rest of the body: *foot* very muscular, orangecolour.

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* From its resemblance to a heart with equal sides.

† Heart.

Shell almost spherical, solid when adult, of a dull hue: *sculpture,* faint concentric striæ, with occasional deeper lines of growth: *colour* yellowish-white, variegated in the young by zigzag streaks of reddish-brown: *epidermis* chestnutcolour, rather thick, covered with extremely numerous rows of very short fine bristles, which are of a darker colour, and radiate from the beak to the margins, except on the upper part of the anterior side where the cilia are wanting: *margins* curved in front, sloping upwards on the anterior side to a blunt angle formed by its junction with the dorsal margin, obliquely truncate at the posterior side, which is indistinctly sinuous; dorsal margin projecting: *beaks* excentric, gracefully recurved and making an incomplete whorl: *lunule* forming a broad excavation below the beaks, and enlarging rapidly during the progress of growth: *ligament* strong and raised, dark reddish-brown, following the bend of the posterior dorsal margin: *hinge-line* curved: *hinge-plate* thick and broad, reflected outwards, occupying rather more than one-third of the circumference: *teeth,* in the right valve two cardinals, the outer of which is laminar and nearly parallel to the hinge-line, and the inner is shorter, very much thicker, and cloven obliquely; between the latter tooth and the inside of the shell is a deep socket for the reception of a similar tooth in the opposite valve; lateral tooth short and triangular; the left valve has two cardinals corresponding with those in the other valve, except that the outer one is cloven obliquely, and the socket is placed on the inside of the thicker tooth; the lateral tooth in this valve is longer than that in the right valve, but not so high: *inside* chalky, with sometimes a faint tinge of flesh-colour, irregularly furrowed lengthwise, apparently in consequence of an unequal secretion by the mantle: *pallial scar* broad and shining: *muscular scars* rather large, that on the anterior side being remarkably deep. L. 4. B. 3·8.

Habitat: Muddy ground in 4–40 fathoms on the coasts of Devon and Cornwall, east and south of Ireland, and west of Scotland. Laskey is said to have taken it off St. Abb's Head. It is not generally distributed, although tolerably plentiful in certain places. Searles Wood has recorded it as a fossil of the Red and Coralline Crag, and it is not uncommon in a layer of brick-earth near Christiania containing shells of arctic species. Lilljeborg has dredged it as far north as Molde fiord near Christiansund; and, according to Maravigna and Philippi, it occurs as far south as Sicily. Many instances may be enumerated of its inhabiting the Scandinavian as well as Mediterranean seas, at depths varying from 15 to 80 fathoms.

By far the best account which has been given of the animal is that by the Rev. James Bulwer, in the second volume of the 'Zoological Journal.' He procured a considerable number of live specimens, taken by trawling in very deep water on the east coast of Ireland. Although this account has been twice republished, it is so interesting and evidently so accurate, that I cannot refrain from inserting here a portion of it. He says, "On being placed in a vessel of sea-water the valves of the shell gradually opened, to the extent represented in the drawing [which accompanies the description]: the feelers or ciliated fringe of the upper* orifice of the mantle moved slowly, as if in search of animalculæ. Having remained in this situation about ten minutes, water was ejected with considerable force from the lower [upper or excurrent] orifice, which had till now remained motionless. The expulsion of the water appeared to be effected by a sudden contraction of the muscles, because this was never done without the valves nearly closing at the same instant. After a few seconds the valves gradually returned to their open position, and remained quiescent as before, till the water was again ejected with a jerk: this alternating process was repeated at unequal intervals during the whole time my specimens were under examination, but at shorter intervals on receiving fresh supplies of sea-water, when, I suppose, food (its quality I could not ascertain) was more abundant. The animal appears to be insensible both to sound and light, as the presence or absence of either did not at all interrupt its movements; but its sense of feeling appeared to be very delicate: minute substances being dropped into the orifice of the mantle instantly excited the animal, and a column of water strongly directed expelled them from the shell. With so much strength was the water in some instances ejected, that it rose above the surface of three inches of superincumbent fluid. Animal small in proportion to its shell, occupying when dead barely a third of the space enclosed in the valves. Its mantle is slightly attached to the shell and to the epidermis at the margin, and appears to be kept distended, and in contact with the interior of the valves, by the included water. The valves fit so closely that the animal can remain two days or more without permitting a single drop of fluid to escape. Locomotion is very confined; it is capable, with the assistance of its foot, which it uses in the same manner (but in a much more limited degree) as the *Cardiacea*, of fixing itself firmly in the sand, generally choosing to have the umbones covered by it, and the orifices of the tubes of the mantle nearly perpendicular. Resting in this position on the margin of a sand-bank, of which the surrounding soil is mud, at too great a depth to be disturbed by storms, the *Isocardia* of our Irish Sea patiently collects its food from the surrounding element, assisted in its choice by the current it is capable of creating by the alternate opening and closing of its valves. Some of the specimens that had been taken four or more days before they were brought to me exhibited on dissection the following curious appearance:—On removing the mantle from the surface of the shell, a considerable quantity of shelly matter of the consistence of thick cream, or like moistened plaster of Paris, was discovered; on a nearer inspection, the interior layers of its shelly covering were found to be deeply corroded in parallel furrows, in some spots so deeply that the brown or outer layers of the shell were laid bare. This shelly matter had undergone no change but that of trituration. To what cause is this appearance to be attributed? Are the animals of this species when in a state of starvation, as these probably were, capable of absorbing a portion of their shell (the gluten), and converting it into nourishment? Or do the animals, when languid and unhealthy, secrete a medium that destroys the cohesion of the particles of which their habitations are formed? In none of the living specimens that I had an opportunity of examining did I detect any parasite; while in nine out of ten specimens of the *Cyprina Islandica* from the same neighbourhood, I found a small *Hirudo* lurking under the mantle of each; and in very many specimens of a *Modiola* from the shallow water of the same coast, a small Crab (*Pisa*) shared the habitation with the animal." Mr. Bulwer also remarked that the *I. cor* of the Mediterranean appeared to differ considerably from that of the Irish Sea in respect of the animal, judging from the description and anatomical drawings of Poli; but the differences he has noticed are probably varietal. Mediterranean specimens are smaller. Linné indulged in some rather fanciful similitudes with regard to the shell, describing it in the tenth edition of the 'Systema Naturæ' as *Cardium humanum*, and in the twelfth edition comparing the beaks to a ram's horns. Knorr, in his 'Deliciæ Naturæ selectæ,' says it is called in France "cœur de bœuf," and in Holland "zots-kappen" or fool's-cap.

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* [The *Isocardia* is delineated in a horizontal position, and this orifice being next to the foot and furthest from the beaks is the *lower* or incurrent orifice.]

It is the *Bucardia communis* of Schumacher and *Isocardia Hibernica* of Reeve.

Genus II. CYPRI'NA *, Lamarck. Pl. VI. f. 2.

Body suborbicular and fleshy: *mantle* rather thick, slightly retractile; edge finely serrated: *tubes* extremely short, but separate; orifices cirrous: *foot* large and extensile.

Shell heart-shaped, convex, concentrically striated: *epidermis* thick and fibrous: *beaks* incurved: *lunule* and *corselet* wanting: *ligament* almost wholly external: *teeth*, in each valve three cardinals, the outer one laminar, besides a single lateral on the posterior side.

We now approach the boundaries of the *Veneridæ*. Clark was of opinion that *Isocardia* might very well merge in the present genus, because the animals of both were similar; but the points of resemblance are common to the family, and there are other characters in which these genera may be distinguished from each other. The difference will appear from a comparison of the generic descriptions given above. Lamarck supposed that *Cyprina* was allied to *Cyrena*, and partook of a fluviatile nature, by reason of its substantial epidermis and strong lateral teeth; and he stated that *Cyprina Islandica* inhabits the mouths of rivers. This is not the case: it is exclusively marine. The only recent species known to us is widely scattered over the seas of the northern hemisphere on both sides of the Atlantic: its fossil remains have been found in every part of the vast territories comprised within the 36th and 80th degrees of latitude, which were submerged during a comparatively recent geological period; and they attest the extent of its diffusion in the glacial epoch. Other species occur in tertiary strata of an older formation; and the history of the genus, according to Mr. Searles Wood, may perhaps date back from the Greensand.

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* From Κύπρις, one of the names of Venus.

This genus was called *Arctica* by Schumacher, and *Cardia, Nympha,* and *Asmidia* by other authors.

CYPRINA ISLAN′DICA *, Linné.

Venus Islandica, Linn. Syst. Nat. p. 1131. *C. Islandica*, F. & H. i. p. 441, pl. xxix, and (animal) pl. M. f. 4.

BODY yellowish-white: *mantle* powdered for some depth with minute red-brown sandy points: margin thickened, and marked with a slender brown line: *tubes* nearly sessile, tinged with red-brown; each orifice is encircled at the base of the cirri which fringe it with a narrow bright red line, varying in intensity of colour; cirri simple, about 20 surrounding the incurrent, and about half that number the excurrent tube: from the latter tube frequently protrudes a globular, transparent, membranous valve: *gills* pale brown, unequal, coarsely pectinated, the outer leaflets more triangular and smaller than the inner: *palps* two on each side, pectinated, of moderate length, triangular and pointed: *foot* thick at the stalk or fulcrum, rather long and sharply pointed.

SHELL obliquely triangular, gibbous towards the beaks, thick, rather glossy: *sculpture*, numerous fine laminar and slightly undulating concentric striæ, which become coarser and more irregular at the sides: *colour* yellowish-white faintly tinged with pink: *epidermis* chestnut passing into dark brown, of a lighter cast or sometimes yellowish with a prismatic hue in the young; it is marked, like the surface of the shell, with laminar striæ: *margins* curved in front and at the anterior side, obliquely truncate at the lower posterior end, and on that side bluntly angular, with an indistinct fold or flexure, which is more observable in immature specimens: *beaks* considerably recurved: *ligament* strong and raised, horncolour or dark brown, partly enclosed in a groove on the dorsal edge: *hinge-line* obtusely angular: *hinge-plate* thick, broad, and flexuous, occupying rather more than one-third of the circumference: *teeth*, in the right valve three cardinals, the middle one strong and short (from which the other two diverge), the anterior triangular, and posterior ridge-like; lateral tooth indistinct; the left valve has likewise three cardinals, two of which on the anterior side are symmetrical and very short, and the third is laminar and diverges from the centre; lateral tooth strong and distinct; the hinge is also furnished with several irregular tooth-like processes on the anterior side: *inside* chalky-white and nearly smooth: *pallial scar* broad and shining: *muscular scars* large and distinct, but not remarkably deep. L. 4. B. 4·25.

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* Icelandic.

Var. *crassior*. Shell thicker, more round, and somewhat compressed: *epidermis* of a darker hue and occasionally pitch-black.

HABITAT: Common in sand mixed with mud, on every part of the British coasts, from low-water mark to 100 fathoms. The variety occurs in Swansea, Cardigan, and Bideford bays. This species is a member of all our newer tertiaries, and peculiarly characteristic of glacial deposits. Every sea of northern Europe and North America still contains it in a living state, its southern limit appearing to be the Boulonnais and Cherbourg. A more globose variety (*C. æqualis*, J. Sowerby) is found in pliocene strata at Nice and in Sicily. This form is the *C. islandicoides* of Lamarck.

Hugh Miller says, in his pleasant 'Sketch-book of Popular Geology,' that *C. Islandica*, "although one of the most common shells of the boulder-clay, is by no means one of the most common shells at the present time of our Scottish coasts." This must be a mistake; for in the Moray Firth, the scene of the gifted geologist's labours, recent shells of this species are very much more abundant than the fossil remains of specimens entombed in the boulder-clay or "till." But in a postglacial or raised beach at Goldspie in Sutherlandshire, close to the brink of high-water mark, I noticed that valves were heaped up in extraordinary profusion, far exceeding in number those now thrown up on the adjacent shore. Neither in the boulder-clay nor in the strata immediately overlying it are entire valves often to be seen—generally fragments only, and that part which contains the hinge, being stronger than the rest of the shell. I believe this may be explained by an anecdote which I was lately told by Mr. Bean. Many years ago he found about a score of fine live specimens on the sands at Filey after a storm, and triumphantly carried them home in his pocket-handkerchief. On his return to Scarborough he put them into a large pan, and poured boiling water on the heap. To his astonishment and dismay, a succession of loud reports ensued, as if a volley had been fired, and all the shells were either broken or cracked. The action of severe frost at a period when the climate and other conditions resembled those of the Polar region, enclosing

> "The ice-lock'd secrets of that hoary deep'
> Where fetter'd streams and frozen continents
> Lie dark and wild, beat with perpetual storm
> Of whirlwind and dire hail,"

might have had the same effect on shells of *C. Islandica* formerly exposed on an Arctic beach, as boiling water has on existing shells of the same species. The fracture may have been caused by an imperfect cohesion of the material —the proportion of animal tissue, compared with that of carbonate of lime, being less in these than in many other shells. In Müller's time the animal was eaten by the natives of Iceland, and called by them "Ku-skiæl" and "Krok-fishur." In the Shetlands it goes by the universal name of "clam." This large and unwieldy mollusk contrives to burrow, like a cockle, by means of its foot, which is permeated by a series of pores communicating with a central tube. This tube opens outside; and through it water is introduced into the vascular portion of the foot, when the latter becomes sufficiently distended to make a passage in the sand for the whole animal and shell. According to Dr. Johnston it is carnivorous: he states that he once found in its stomach "the undigested remains of a large green *Nereis*, enveloped in a pulp which was certainly too consistent to have been the sediment from water, however loaded with animalcula." This, however, is so contrary to the known habits of the Acephala, that the admission and detention of the Annelid may be accounted for in some other way. Possibly, having entered into the body of the *Cyprina*, it could not get out, and thus suffered a lingering death. The contraction of the larger tube, or the valve of the smaller one might have prevented its escape in that direction; and the stomach has no other vent. At any rate, the fact of the *Nereis* being "undigested" would lead to an inference that such was not the ordinary food of the *Cyprina*. The same excellent naturalist also remarked that this mollusk and the horse-mussel often swallow the bait of the fisherman. It is true that they are frequently caught by the hooks; but their palps are not prehensile; and I should be rather disposed to attribute their capture to the fishing-lines being dragged by the tide or the motion of the sea, and to the hooks coming into accidental contact with the gaping shell-fish. *C. Islandica* is apt to be infested by species of *Pinnotheres* and *Planaria*.

Lister first described this shell. Linné, and after him Pennant, seem to have confounded it with *Venus mercenaria*. It is the *Pectunculus crassus* of Da Costa, and *Cyprina vulgaris* of Brown. The latter name was adopted by Mr. G. B. Sowerby, in his 'Genera of Recent and

Fossil Shells,' from a supposition that the Icelandic shell was not the same as ours.

Genus III. ASTAR'TE *, J. Sowerby. Pl. VI. f. 3.

Body suborbicular, compressed: *mantle* rather thick; edge plain: *foot* rather small but strong, and conical.

Shell more or less triangular, compressed, concentrically furrowed (especially in the young) or striated: *epidermis* yellowish or chestnut-brown, sometimes rayed, and usually thick and fibrous: *beaks* prominent, slightly recurved: *lunule* distinct, heart-shaped, or lanceolate: *corselet* elongated: *ligament* mostly external: *teeth*, in each valve three cardinals, the outer one of which on the posterior side in the right valve, and that on the anterior side in the left valve, are small and indistinct; laterals ridge-like and slight, one on either side in each valve.

Brocchi in 1814 pointed out the peculiar characteristics of this genus, and provisionally associated the only species then known with *Capsa*. The author of 'The Mineral Conchology of Great Britain,' Schumacher, and Lamarck gave it in 1816, 1817, and 1818 the several names of *Astarte, Tridonta,* and *Crassina*. This shows the order of their relative priority; and although Sowerby comprised in his genus species which do not belong to it, viz. *Venus Paphia, V. fasciata,* and *V. subcordata,* he distinctly stated that *A. sulcata* was the type. Lamarck placed *A. sulcata* and *A. castanea* in *Venus*. The late Mr. G. B. Sowerby first noticed the relation of *Astarte* to *Cyprina*. Scacchi and Philippi considered the animal allied to *Cardita*. C. F. Römer published in 1842 an elaborate treatise on the genus; and De la Jonkaire had previously given a monograph of the fossil species.

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* The Phœnician goddess of the Moon, or (according to Cicero) a synonym of Venus.

The shell of *Astarte* is a symbol of change; and although the genus may be distinguished from others, this cannot be said of the species *inter se*. I do not know a more puzzling study. What is true of the pictorial art is equally applicable to the science of classification in natural history. Ruskin treats the matter thus: "Nearly all the gradations of nature are so subtle, and between degrees of tint so slightly separated, that no human hand can in any wise equal, or do anything more than to suggest the idea of them." So it is with the forms of organic nature. A net of chainwork conveys a very inadequate idea of the intricate way in which all these forms are intermingled and blend one with another. No method of systematic arrangement that is possible for the wit of man to devise will serve to decipher this complicated mystery. To read for the first time a cuneiform inscription is mere child's play compared with the solution of this enigma. All that we can do is to observe carefully, and with fit reverence, the works of our Creator, and to record faithfully those observations for the instruction or gratification of the present and future generations. One cause of difficulty in discriminating the species of *Astarte* has happily been removed. This consisted in the inner margin of the shell being notched in some kinds, and plain in others which could not else be distinguished. Récluz in 1844 eliminated this supposed mark of specific difference by uniting the *A. triangularis* and *A. minutissima* of Montagu; Turton had more than twenty years previously noticed that *A. sulcata* and *A. Scotica* presented only the same criterion of separation; and Forbes and Hanley confirmed the justice of that remark by showing that these last two so-called species were identical. It has been for some time the prevalent opinion that the crenulation of the inside edge was a sign of maturity, although some conchologists suggested that it might denote a sexual difference; but the former is opposed to my own observation (especially as regards *A. triangularis*), and no investigation appears to have been made to warrant the latter. Dr. Malm has offered another explanation, by showing that when the margins in the course of growth meet on a rib the inside is notched, but if they meet on a furrow it is plain; and he observes that the same takes place in species of *Murex*, which have the inside of the outer lip grooved in perfect examples. To that extent, therefore, the character is correlative with development: but it is exhibited by *A. triangularis*, which never has any ribs; I have adult specimens of *A. sulcata* with the margin quite plain and smooth in front, but distinctly notched on each side; and *A. compressa* has always a plain edge, although the shell is ribbed. Some of the cardinal teeth are often rudimentary or so indistinct that, without a close scrutiny, there appear to be only two teeth in the right, and one in the left valve, which locks into a hollow space between the opposite pair.

Astarte may be said to be "at home" in the far north. Only two species inhabit the Mediterranean, and those sparingly, while thrice that number abound within the Arctic circle. They frequent sand, more or less mixed with mud, at various depths; but none are littoral. Many species of remarkable productiveness swarmed in tertiary seas. Fossil shells of that group of *Venus* which is represented by *V. fasciata* may easily be mistaken for species of *Astarte*, some of the characters which distinguish the latter genus being lost by the removal of the colour and epidermis.

A. More or less ribbed.

1. ASTARTE SULCA'TA *, Da Costa.

Pectunculus costatus, Da Costa, Brit. Conch. p. 192. *A. sulcata*, F. & H. i. p. 452, pl. xxx. f. 5, 6 (as *A. Danmoniensis*), pl. cxxxiii. f. 4 (as *A. sulcata*, var.), and (animal) pl. M. f. 5.

BODY more or less tinged with fleshcolour: *mantle* plain-edged, and girt with a narrow belt of orange: *tubes* scarcely separated from each other; orifices bordered with orange, like the mantle: *gills* of a pale yellowish hue: *palps* rather large, of a lanceolate-triangular shape, strongly striated externally, and of a pale tawny colour: *foot* not large in proportion to the shell, of a pale flesh or fawncolour. [This description has been taken from the 'British Mollusca.' I suspect that the animal had been killed with hot water before it was examined. Being so common, I omitted to make any note of it; but my recollection of the colour and proportions does not agree with the above.]

SHELL obtusely triangular, with an oblique outline, somewhat compressed, thick, of a dull hue: *sculpture*, 24–40 strong and angular ribs, which are much more crowded towards the beaks and gradually vanish or are wholly wanting on the posterior side; the surface is also covered with intermediate concentric but irregular striæ: *colour* milk-white beneath the *epidermis*, which is chestnut or of various shades of brown, and marked with exquisitely minute and innumerable hair-like, slightly undulating, and punctured transverse striæ: *margins* curved in front and on the anterior side, and slightly truncate on the posterior side: *beaks* excentric, considerably recurved towards the anterior side: *lunule* and *corselet* deep, well defined, and smooth: *ligament* short, yellowish or horn-colour, enclosed within the dorsal line, and partly contained in a groove excavated out of the hinge-plate: *hinge-line* obtusely triangular: *hinge-plate* thick and broad, especially in the middle, occupying about one-third of the circumference: *teeth*, in the right valve three cardinals, the outermost and posterior of which is very indistinct and laminar, and the other two are much larger, obliquely triangular, and diverge outwards, leaving a deep and triangular cavity between them for the reception of the middle tooth of the left valve; there is also an obscure lateral on each side; the left valve has likewise three cardinals, of which the middle one is by far the largest, triangular, and blunt; the other two are laminar and diverge in opposite directions, the anterior tooth being the slightest; lateral teeth as in the right valve: *inside* chalky-white, with a thin superficial layer which is microscopically tubercular and glistening; margin thickened in front and at the sides, and finely crenulated or notched: *pallial scar* narrow, slightly impressed: *muscular scars* irregularly elliptical or conchoidal, very distinct. L. 1·1. B. 1·2.

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* Furrowed.

Var. 1. *paucicostata.* Shell smaller, having fewer and thicker ribs; inside margin either smooth or notched.

Var. 2. *Scotica.* Shell usually rather compressed; inside margin thin and smooth. *Venus Scotica*, Maton and Rackett, in Linn. Trans. viii. p. 81, t. 2. f. 3.

Var. 3. *elliptica.* Shell commonly still more compressed, broader than long, in consequence of the posterior side being more produced than in the typical form; upper or dorsal slope nearly straight; ribs more or less evanescent in front and at the sides; inner margin smooth. *Crassina elliptica*, Brown, Ill. Rec. Conch. p. 96, pl. xxxviii. f. 3. *A. elliptica*, F. & H. i. p. 459, pl. xxx. f. 8.

Var. 4. *truncata.* Shell more than ordinarily triangular; front margin nearly straight or truncate.

Var. 5. *minor.* Shell smaller and more convex.

Var. 6. *trigona.* Shell nearly as small as the last and decidedly triangular.

Var. 7. *incrassata.* Shell obliquely triangular; ribs more or less evanescent in front and at the sides. *Venus incrassata*, Brocchi, Conch. Foss. Subap. ii. p. 557, tav. xiv. f. 7.

Var. 8. *multicostata.* Shell somewhat triangular; ribs numerous.

HABITAT: Sand and mud, in 7–85 fathoms, on all our coasts from Falmouth (Couch) to the Shetland Isles. Captain Beechey dredged it in 145 fathoms off the Mull of Galloway. It is most plentiful in the west of Scotland. Mr. Jordan has lately taken numbers of it in Milford Haven; but otherwise it does not seem to be common in the south. *A. sulcata* occurs in many of the upper tertiary strata up to the Red Crag, the variety *elliptica* being the more usual form in glacial deposits. This form has not been found south of Great Britain; but the variety *incrassata* has a wide range in that direction, throughout the Mediterranean and Hellespont to the Canaries. Northward this species reaches Iceland, Upper Norway, and the White Sea, as well as North America (and the variety *elliptica* as far as Spitzbergen), at depths varying from 3 to 160 fathoms. All the other varieties which I have specified come from the Hebrides and Shetland.

The animal is very inactive; and when buried in mud the shell is often incrusted with a mineral coat like tar. Specimens living in tenacious and fetid soil have the beaks and umbonal area more or less eroded. They are now and then distorted; and I found a large and malformed pearl in one. The ribs are less numerous and developed in southern examples of the typical form than in those from more northern parts. The inside is sometimes of a lovely salmoncolour. In specimens from the Northumberland coast and Skye the front margin is plain and the sides are crenulated. The larger kinds of *Asterias* are said by M. Gay to prey upon *A. incrassata.*

I have failed to separate intermediate forms from either the typical species or the variety *elliptica.* They may belong to one or the other. Particular specimens, and indeed the bulk of them, may be readily distinguished; but although it may not be agreeable to the mere collector, whose object is to get as many species as he can, I must regard the *Crassina elliptica* of Brown as only a variety and northern form of this most inconstant species. I have never in the course of my dredging-experience found them in company on the same ground: doubtful specimens occur where they might be looked for—viz. on the confines of two localities, each inhabited by its own form. The above remarks equally apply to the *A. incrassata* of Brocchi, except in its being a southern form. Philippi at first considered it the same as our species, but he afterwards changed his opinion on the authority of M. Koch. Deshayes, in his edition of Lamarck, represents *A. incrassata* and the *Tellina fusca* of Poli as two distinct species; but Philippi demurs to this, on the ground that the extent of sulcation and the comparative convexity of the shell are very uncertain characters. Such a conflict of opinion is easily settled by pronouncing the three species to be distinct; but I believe the sounder judgment will be that all are identical. It is impossible to ascertain, or even to conjecture with any reasonable probability, how much change prolific and hardy species, like the present, may have undergone during the lapse of countless generations;

> "For formes are variable, and decay
> By course of kind and by occasion."

The *A. elliptica* of the north, *A. sulcata* of more temperate seas, and *A. incrassata* of the south are evidently so closely allied to one another that it is not unphilosophical to suppose that they originated from the same common stock. The slight differences which they present among themselves may have been caused by local or accidental conditions. I need not apologize for particularizing so many varieties, as all naturalists are agreed as to the utility of this mode of discrimination. The time has gone by when varieties were not regarded. At present the course of scientific inquiry tends the other way; and varieties must be named, or have some equivalent symbol of distinction.

This species is the *Venus Danmonia* (properly *Damnonia*) of Montagu, *V. Petagnæ* of Costa, and *Crassina Britannica* of Leach. The North-American form has been called by Hanley *A. latisulca*, and by Gould *A. undata*. The variety *elliptica* is the *Venus compressa* of Linné's 'Mantissa Plantarum,' *Crassina ovata* and *C. depressa* of Brown, *C. sulcata* of Nilsson, *A. Gairensis* of James Smith, and *A. semisulcata* of myself, Lovén, Möller, and Philippi, but not of Leach.

2. A. COMPRES'SA *, Montagu.

Venus compressa, Mont. Test. Brit. Suppl. p. 43, t. 26. f. 1. *A. compressa*, F. & H. i. p. 464, pl. xxx. f. 1–3.

BODY greyish-white: *mantle* plain-edged: *tubes* scarcely perceptible outside the shell: *foot* white.

SHELL acutely triangular, nearly equilateral, rather convex, thick, somewhat glossy: *sculpture*, sometimes only slight, irregular, and scarcely elevated ridges in the line of growth, but more commonly also close concentric ribs on the umbonal area; the surface is covered, as in the last species, with finer interstitial striæ: *colour* milk-white beneath the *epidermis*, which is of various hues from yellow to chestnut-brown, and is seen under the microscope to be reticulated lengthwise by innumerable rows of punctures: *margins* curved in front, obtusely angular or truncate on the anterior side, with a sharply rounded point, and sloping or gently curved on the posterior side to a blunter point: *beaks* almost central, considerably recurved towards the anterior side: *lunule* and *corselet* deep and nearly smooth: *ligament* cylindrical, of moderate length, yellowish-brown, not projecting beyond the dorsal line, partly contained in a groove on the hinge-plate: *hinge-line* nearly rectangular: *hinge-plate* thick and broad, occupying about two-fifths of the circumference: *teeth* as in *A. sulcata*, but the cardinals are proportionally stronger, and the anterior laterals (especially that of the left valve) are more developed: *inside* porcellanous, slightly nacreous, and minutely tubercled; margin sharp and smooth, bordered within by a slight but distinct ridge, forming a bevelled edge: *pallial* and *muscular scars* as in the last species, but the latter are more deep. L. 0·5. B. 0·5.

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* Squeezed together.

Var. 1. *globosa*. Shell much larger, and usually more convex, inclining to a circular shape, with fine and regular ribs, which in the adult generally disappear towards the front and sides. L. 0·8. B. 0·9. *A. globosa*, Möller, Ind. Moll. Grœnl. p. 20.

Var. 2. *striata*. Shell more closely ribbed. *A. striata* (*Nicania striata*, Leach), Möll. l. c.

Var. 3. *nana*. Shell much smaller, either smooth or partly ribbed. L. 0·225. B. 0·225.

HABITAT: Sand, often mixed with mud, in 20–50 fathoms, off Scarborough (Bean), and Mull (Bedford): the typical form appears to be very local. Subfossil in 25 fathoms off Larne, co. Antrim. Var. 1. Rather common off Skye, the coasts of Argyle and Ross, and east of Shetland, in 30–80 fathoms. It resembles in shape *Corbicula* (or *Cyrena*) *fluminalis*. Var. 2. Plentiful on the coasts of Yorkshire, Northumberland, and Durham, Firth of Forth, west of Scotland, and outer Hebrides, in sand and mud, at from 3 to 50 fathoms. This variety occurs in all our newer tertiaries, as far back as the Red Crag; and it is peculiar to the glacial deposits. Var. 3. Fifteen miles N.W. of Mull (Bedford). It seems to present a link connecting the present with the next species. *A. compressa*, and particularly the variety *striata*, are extensively distributed throughout the North Atlantic from Spitzbergen and the White Sea to the Cattegat, as well as on the north-eastern coasts of America, at depths varying from 10 to 140 fathoms. It is found in the Uddevalla and other similar deposits in Scandinavia; Risso has recorded it, under the name of *Cyprina Montagui*, as fossil in the "terrains diluviens" at Nice; and Drexler found it in "pliostene" strata in Hudson's Bay.

It is not less variable than *A. sulcata*; and if a specimen of the smooth, flat and triangular form were placed side by side with the fine-ribbed, convex and rounded variety *globosa*, it would be difficult to imagine that they were the same species. *A. compressa*, in all its phases, may be known from any of the smooth-edged varieties of *A. sulcata* by its inferior size, the shape being always more triangular than square, the beaks being more central, and by the ribs (where they exist) being much finer and more numerous in proportion to the size of the shell. I received from Mr. Dawson of Cruden a specimen found by him in the Moray Firth, which had the hinge reversed, the right valve exhibiting the teeth that properly belonged to the left valve, and *vice versâ*. The muscular impressions were as usual; but that would be the case, whether the right valve had changed place with the left or they had retained their normal relation to each other. I am not aware of a similar instance of such a partial transposition. The instances of *Lucina Childreni* and *Chama Lazarus*, mentioned by Gray in the 'Zoological Journal' and 'Philosophical Transactions,' are different, inasmuch as those shells are inequivalve. Bivalve mollusca can never be completely reversed like univalves, because the internal organs of the former are symmetrical, and those of the latter are confined to one side or position.

I have before observed that this is not the *Venus compressa* of Linné. Among the many synonyms of our species may be mentioned *V. Montacuti*, Turton, *Nicania Banksii*, Leach, *Crassina convexiuscula* and *C. obliqua*, Brown, *A. multicostata* and *A. Uddevallensis*, J. Smith, *A. pulchella*, Jonas, and *A. propinqua*, Landsborough.

B. Smooth or slightly striated.

3. A. TRIANGULA'RIS *, Montagu.

Mactra triangularis, Mont. Test. Brit. p. 99, t. 3. f. 5. *A. triangularis*, F. & H. i. p. 467, pl. xxx. f. 4.

SHELL forming almost an isosceles triangle, and more or less equilateral, with a somewhat oblique outline, compressed and sloping gradually from the umbonal part to the margins, like a sharp wedge, thick for its size, rather glossy: *sculpture*, irregular lines of growth, or a few very slight and indistinct concentric ridges: *colour* white beneath the *epidermis*, which is of various hues from pale yellow or orange to purplish-brown or chocolate, rarely milk-white, often marked with streaks of a darker tint, which radiate from the direction of the beaks towards the front, where and on the posterior side they are chiefly conspicuous; the epidermis appears under a high power to be microscopically punctured all over, but not in rows: *margins* rounded in front, with an oblique curve to the posterior angle, more or less straight on the anterior side, and inclined to straight or but slightly curved on the posterior side: *beaks* extremely prominent but blunt, almost central, recurved a little towards the anterior side: *lunule* heart-shaped and deep: *corselet* slight and short: *ligament* very short and protuberant, of a yellow or brown tinge, according to the colour of the epidermis, partly sheathed in a cardinal groove: *hinge-line* acute-angled: *hinge-plate* extremely thick and broad, occupying scarcely one-third of the circumference: *teeth* as in the other species, but the chief cardinals are much stronger in proportion, and the third or smallest in each valve is barely perceptible, the laterals being fine and ridge-like: *inside* polished and nacreous, sometimes faintly striated lengthwise; margin either thickened and closely denticulated, or else bevelled and quite smooth: *pallial* and *muscular scars* distinct, especially the latter. L. 0·125. B. 0·125.

HABITAT: Local, but gregarious, on all our coasts from the northern extremity of Shetland to the Channel Isles, in sand, at depths of from 3 to 60 fathoms; it is remarkably abundant at Lewis in the outer Hebrides and at Guernsey. It occurs, but not commonly, in all our upper tertiaries and associated with high-northern species of shells. The recent diffusion of this species appears to have been southward: I cannot find it enumerated in any list of Arctic or even Scandinavian mollusca; but it has been recorded by Mr. M'Andrew and myself as Mediterranean, and by the former as dredged at the Canaries. It is probably a pliocene fossil of Apulia under von Münster's name of *A. lævigata*, and an inhabitant of the Ægean (in 70–112 fathoms) as the *A. pusilla* of Forbes.

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* Triangular.

The animal of this diminutive and pretty species has escaped notice. The shells are often drilled by the smaller *Muricidæ*. When fresh they are semitransparent, so that the marginal indentation is visible outside. The young are transversely oval, and in shape not unlike *Pisidium pusillum*. The hinge is now and then reversed, as in *A. compressa*. Probably such monsters are not exceedingly rare, but may not have been searched for.

Turton proposed to make another genus (*Goodallia*) out of the present species and its plain-edged variety (*Mactra minutissima*, Montagu), from an erroneous notion that the ligament was internal. Two or three more generic and specific names have been bestowed on the same species by different writers, all of which may be treated as obsolete.

A. crebricostata of Forbes inhabits the Arctic seas: it has never been taken alive, or even in a suspiciously fresh state, on our coasts. Valves have been dredged by Mr. M'Andrew off the west coast of Shetland, and also by that gentleman, Mr. Barlee, and myself at different times in the Hebrides. The species nearest to it is *A. sulcata*, from which it differs in its more oblique outline and compressed form, finer and more constantly numerous ribs, and its peculiar epidermis, which is coarsely fibrous. The margin is usually, but not always notched; and as this is the only particular in which the *Crassina depressa* of Brown appears to differ from Forbes's species, they are probably the same. The name given by Brown is much prior to the other. I believe that in its young state it is the *A. crebrilirata* of Searles Wood from the Red Crag.

A. borealis, Chemnitz, which rejoices in the various synonyms of *corrugata*, *arctica*, *lactea*, *semisulcata* (Leach), *islandica*, *cyprinoides*, *veneriformis*, and *compressa* (Macgillivray), besides several other designations added by palæontologists, is also a native of high-northern latitudes, but not of our own seas. Imperfect specimens have been dredged in the Hebrides, Moray Firth, and on both sides of Shetland. It is a common newer pliocene fossil, and found in every glacial deposit. The most southern known limit of its habitation is Kiel Bay in the Baltic. The shape of this shell is angular and nearly flat; the surface is smooth, or faintly striated in the line of growth, except towards the beaks, where there are several fine concentric ribs; and the epidermis is coarsely fibrous as in *A. crebricostata* or *depressa*. It attains a larger size than that shell. The occurrence of the last two species in our seas, in a semifossil state, may be accounted for in the same way as that of *Pecten Islandicus*, page 58.

A. castanea of Say, a North-American shell, has been called British without any sufficient reason. It is the *Venus sulcata* of Montagu, as well as of Maton and Rackett. Mr. J. Sowerby gave a specimen as "English" to the former; and Mr. Swainson informed the latter that he received one from the Duchess of Portland, also as "English," and moreover that the shell had since been found in the north of Scotland, where it was known by the trivial name of the "brown circular-furrowed northern Cockle." Fleming justly remarked that this descriptive epithet "seems somewhat different from the usual provincial appellations." Lamarck has given another equally extraordinary habitat for this species, viz. "Côtes de France, à Cherbourg."

Genus IV. CIRCE *, Schumacher. Pl. VI. f. 4.

Body suborbicular, compressed: *mantle* rather thick; edges denticulated: *tubes* very short; the larger or incurrent one bag-shaped, and the other sessile and scarcely visible outside the shell; orifices fringed; *foot* proportionally large.

Shell rounded or triangular, compressed, concentrically but slightly furrowed: *epidermis* thin: *beaks* prominent, not much recurved: *lunule* distinct, lanceolate: *corselet* narrow: *ligament* partly external and partly concealed within the corselet: *teeth,* in each valve three diverging cardinals, the outer one on the posterior side in the left valve cloven lengthwise, so as to resemble two; laterals, one on the anterior side in the right valve, and two on the same side in the left valve: *scars* inconspicuous.

The genus *Circe* was constituted by Schumacher in his 'Essai d'un nouveau système des habitations des vers testacés'; and the diagnosis and further description which he gave are so explicit, that I have no doubt it would include the British shell described by Montagu as *Venus minima,* and its variety (*V. triangularis* of the same author), and placed by subsequent writers in the genera *Cytherea* and *Cyprina.* The deceased Professor C. B. Adams (whose memory is deservedly cherished by his brother naturalists in the United States as an assiduous conchologist) proposed another genus, having similar characters, with the name of *Gouldia,* in honour of his equally distinguished fellow-countryman;

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* A Sea-Nymph and noted sorceress.

and the latter name has been adopted by Messrs. H. and A. Adams, in their 'Genera of Recent Shells,' under the impression that it is different from Schumacher's genus. It resembles *Venus* in many respects; but in that genus the tubes are long, and the pallial scar on the posterior side of the shell exhibits therefore a deep fold or sinus. The typical species quoted by Schumacher is the *Venus scripta* of Linné. It is somewhat remarkable that our British shell (*Circe minima*), which Ulysses of Salis Marschlins mentions in his 'Travels' as being found on the Neapolitan coast, was called by him *V. scripta*. The name *Circe* has been used by Mertens for a genus of Acalephæ; but the gap is so wide between the Cœlenterata and the Mollusca, that there is little or no risk of confusion in consequence of the same name being applied to forms of animal life so diametrically opposite, although it is unquestionably better in proposing new genera to avoid the possibility of such a mistake.

The habits of *Circe* are generally cleaner than those of *Astarte*, the present genus apparently preferring nullipore and shelly sand to a muddy ground.

CIRCE MI'NIMA*, Montagu.

Venus minima, Mont. Test. Brit. p. 121, t. 3. f. 3. *C. minima*, F. & H. i. p. 446, pl. xxvi. f. 4, 5, 6, 8, and (animal) pl. M. f. 3.

BODY greyish-white, gelatinous: *mantle* slightly speckled with brown: *tubes* of unequal size; marginal cirri numerous, short and cylindrical, covered with specks of a brown-red or purplish colour: *foot* white, extensile, and pointed.

SHELL nearly circular or obtusely triangular, usually depressed except towards the beaks, rather solid, opaque, and glossy: *sculpture*, numerous flat, broad, laminar concentric ridges, of a somewhat irregular width, the interstices or furrows being very narrow and slightly impressed; the surface is also covered with minute and irregular intermediate striæ: *colour* from milk-white to rich purple, through all the shades of yellow, brown, and red, often variegated or relieved by diagonal streaks or rays of some one of those tints, and interspersed with spots, or lineated in a zigzag pattern; a common arrangement of these varied hues consists of two streaks of a darker or lighter reddish-brown radiating from the beaks at an acute angle, one towards each side, and resembling an inverted V; the colouring is so diversified, that it is almost impossible to describe it: *epidermis* semitransparent, like a coat of varnish: *margins* semicircular in front and at both sides. for at least half of the circumference, straight on the upper part of the anterior side below the beaks, and sloping either abruptly or with a gentle curve on the dorsal side to the posterior angle: *beaks* regularly but not much recurved: *lunule* not deep, defined by an impressed line: *corselet* slight: *ligament* short, horncolour; half of it is visible outside, and the base rests on a groove excavated within the dorsal margin: *hinge-line* rounded: *hinge-plate* thick, and somewhat flexuous: *teeth*, as in the description of the genus; the two cardinals in the right valve on the anterior side are shorter and thicker than the other on the posterior side, which is laminar and nearly parallel to the dorsal line; in the left valve the middle cardinal is the shortest and thickest, that on the anterior side is much smaller than the rest, and the tooth on the posterior side (which is double) corresponds with the laminar tooth in the right valve; laterals short and strong, the inside tooth in the left valve being considerably smaller than the other: *inside* polished and slightly nacreous, sometimes tinged with fleshcolour; margin bevelled and smooth, but occasionally in the left valve it is indistinctly crenulated: *scars* not very distinct. L. 0·55. B. 0·6.

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* Smallest.

Var. *triangularis*. Shell acutely triangular, in consequence of the beaks being more prominent and the sides more truncate. *Venus triangularis*, Mont. Test. Brit. p. 577, tab. 17. f. 3.

HABITAT: All our coasts, on a sandy or nullipore bottom, in 5–85 fathoms. The variety has been found by Montagu and myself in Falmouth Harbour. This species occurs in the Red and Coralline Crag. Sars has dredged it in Manger fiord on the coast of Finmark; but it appears on the whole to be a southern form, ranging from Vigo along the Lusitanian shores eastward to the Mediterranean and Ægean, and westward to Madeira and the Canaries, at depths between 4 and 95 fathoms.

It bears the following names, besides those given by Montagu: *Venus pumila,* Lamarck, *V. Cyrilli,* Scacchi, *Cytherea apicalis,* Philippi, *Cytherea minuta,* Brown, and probably *Venus* (*Cytherea*) *occitanica,* Récluz.

*** Mantle open in front, and forming at the posterior side two more or less elongated tubes.

Family XIII. VENERIDÆ, Leach.

Body nearly orbicular, oval, oblong, or globose: *tubes* produced, cylindrical: *gills* unequal: *foot* tongue-shaped and large, adapted for burrowing in gravel, sand, or mud.

Shell equivalve, triangular, rhomboidal, or globular; variously sculptured, or almost smooth: *beaks* incurved, and turned towards the anterior side: *ligament* external, placed on the larger side of the shell: *hinge* strong, furnished with three or four cardinal teeth in each valve (one genus having two only in the left valve), some of which are cloven or double, and an obscure and ridge-like lateral tooth on the posterior side: *pallial scar* deeply sinuous: *muscular scars* oval and distinct.

The deep sinuation of the pallial scar will always serve to distinguish the *Veneridæ* from any of the immediately preceding families. It denotes also a corresponding difference in the structure of the animal, the siphonal tubes being extensile and issuing from a sheath or fold of the mantle in this family, instead of sessile or short as in the other families. The form of the shell in the typical genus *Venus* is similar to those of *Cyprina* and *Circe*; but the lateral teeth are less distinct, and it even requires some degree of conchological faith to believe in their existence. The present family abounds in species mostly frequenting southern latitudes. Nearly all of them live in soft ground, buried a couple of inches in gravel, sand, or mud, or among nullipores. A variety of *Tapes pullastra,* however, inhabits the deserted holes of *Pholades* and *Saxicavæ,* as well as the crevices of submarine rocks, wisely accommodating itself to the circumstances in which it happens to be placed. Their bathymetrical range is very extensive, one kind (*Venus gallina*) inhabiting the shore and the greatest depth ever reached by the dredge. From the investigations of Dr. Carpenter into the microscopical texture of their shells, we learn that they are porcellanous and hard, containing scarcely any animal matter. Some kinds are supposed to occur in secondary formations; but owing to the main feature by which they are known from other bivalves of the same shape being internal, and therefore difficult to ascertain in petrifactions, their geological history is necessarily involved in some obscurity. Their own systematic relations and divisions into genera are also unsatisfactory. With the exception of *Lucinopsis,* it is difficult to define any of these genera by precise characters. Deshayes appears to be right in rejecting the claims of *Cytherea,* and Clark has given equally valid reasons for contesting the separation of *Artemis* from *Venus.* I am not convinced that *Tapes* has a better right to be considered distinct, unless restricted to two out of the four British species which have been assigned to that genus; but I will retain it provisionally, in deference to other conchologists. The number of genera into which it has been proposed during the past century to distribute the species of *Venus* alone, is almost incredible.

Genus I. VENUS *, Linné. Pl. VI. f. 5.

Body suborbicular or oval: *mantle* having its edges fringed or cirrous: *tubes* more or less united.

Shell triangular, solid, fluted or ribbed concentrically, sometimes cancellated, or else nearly smooth: *lunule* heart-shaped or lanceolate: *teeth*, three or four strong and divergent cardinals, besides the typical lateral in each valve.

The name of this genus conjures up an idea of beauty, which is fully realized by contemplating the graceful form of the shells comprised in it. Whatever the case may be with regard to Diatoms and other low types of vegetable life, there is no angularity in the outline of animal organisms. Every one of these objects is "teres atque rotundus," and offers a striking contrast to the stiff and often inelegant works of man. I do not share Herrick's avowal,

> "I must confess mine eye and heart
> Dote less on Nature than on art."

To enhance the charm of a rounded contour in the shells of Mollusca, each part is repeated in the Brachiopoda and Conchifera by valves resembling the cover of a clasped book, in many of the Pteropoda and most of the Gasteropoda by a succession of similarly shaped whorls arranged spirally on a common axis, and in the Cephalopoda by a series of cells or imbricated plates. The same principle of repetition is followed in the organization of the body of each mollusk: it has a double mantle, two wing-like expansions, one or two pairs of tentacles, or a circle of feet armed with rows of suckers. An harmonious symmetry pervades the whole.

Although I do not think there are sufficient grounds, as regards the British Mollusca, for any dismemberment of the genus beyond the separation of *Tapes* and *Lucinopsis*, I will indicate the divisions in the same way as I have grouped other genera. Those belonging to the genus *Dosinia* of Scopoli (*Arthemis* of Poli), *Cytherea* of Lamarck, and *Timoclea* of Leach are the most remarkable; but the gradation from one to the other, as well as from each to the typical form, is too slight to warrant such a multiplication of names for a few objects which, it must be confessed, are closely related. In the species first alluded to, the siphonal tubes are united for their entire length, which is not the case in most other species. But nearly the same diversity has been observed between individuals of the same species (*V. gallina*), and it exists also between *Tapes pullastra* and *T. decussatus*, which clearly are congeneric. The shell of *V. exoleta* (the type of *Dosinia* or *Artemis*) differs little in shape from that of *Circe* or of some varieties of *V. fasciata*. The type of *Cytherea* (*V. Chione*) has an extra tooth and a nearly smooth surface; but in all other particulars it is a true *Venus*; and I agree with Mr. Clark that we have something more to do than to "ring the changes on trivial points." *Callista* was the name given by Poli to the animal of *Venus, Tapes,* and *Mactra*.

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* The Goddess of Love.

A. Mantle-tubes united throughout. Shell nearly orbicular, concentrically imbricated; inside margin plain.

1. VENUS EXOLE'TA*, Linné.

V. exoleta, Linn. Syst. Nat. p. 1134. *Artemis exoleta*, F. & H. i. p. 428, pl. xxiii. f. 3, 4.

BODY suborbicular, pale yellowish-white: *mantle* having its edges fringed with close-set white cilia, which are most distinct anteriorly, but as they approach the posterior end become less pronounced and are resolved into dentations: *tubes* short, scarcely protruding beyond the shell, united, of much the same size, rufous around the orifices; the upper orifice is almost plain or has a few scalloped points; the lower orifice has eight short dull-rufous cirri: *gills* pale brown: *palps* short and triangular, strongly striated transversely within, and less so on the outward surface: *foot* very large, occupying nearly the ventral range, and always presenting itself as axe-shaped; the heel is rather slender and bluntly pointed, but the rest of the foot can sufficiently protract itself to represent a thick, short, strong, broad linguiform organ; its pure white colour is relieved by beautiful vertical lines of brilliant snow-white. (Clark.)

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* Worn away.

Shell almost circular, compressed, solid, opaque, rather glossy: *sculpture*, numerous flattened concentric laminæ which are imbricated or fold backwards, and become closer and irregular at the sides; the surface is also covered with still more numerous microscopical longitudinal striæ which exhibit the inner texture of the shell: *colour* yellowish-white, usually variegated with rays or zigzag streaks of reddish-brown, purplish-red, or pink of various shades, which are occasionally broken and sometimes present the appearance of white rays on a dark ground: *epidermis* thin, yellowish, only observable in young specimens, as it is rubbed off in the adult by the continual friction of sand: *margins* rounded on all sides except below the beak, where the lunule is excavated; the posterior side has a blunt angle in the middle, and the anterior side appears high-shouldered and also forms an obtuse angle where the lunule ends: *beaks* separated, considerably and somewhat obliquely recurved: *lunule* heart-shaped, defined by a deeply impressed line, coarsely striated in an oblique direction, usually of a purplish hue; lips prominent or pouting: *corselet* narrow, but deep: *ligament* rather long, horncolour, sunk within the corselet: *hinge-line* rounded or obtusely angled: *hinge-plate* thick, broad, and flexuous: *teeth*, in the right valve four cardinals, that on the anterior side being small and tubercular, and the other three laminar and divergent (the middle one cloven or double); in the left valve are three divergent laminar cardinals, the posterior one being double; lateral tooth in each valve long, and more like part of the hinge-plate: *inside* polished and slightly freckled, sometimes stained with purple on the posterior side; margin bevelled: *pallial scar* remarkably deep: *muscular scars* oval and distinctly marked. L. 2 (nearly). B. 2.

Habitat: Sandy bays, and occasionally in deeper water, from one extremity to the other of the British seas. Bright-coloured specimens are common in the "Coral-sand" dredged in Bantry Bay for manure. Grainger has noticed it as occurring in the postglacial bed at Belfast, and Smith in the Clyde beds; it is also a Coralline Crag fossil. Its most northern limit appears to be Finmark, and the most southern Sicily, although it is possible that Adanson described and figured it from the Isle of Goree, under the name of "Le Cotan." M'Andrew obtained specimens at low-water in Vigo Bay and at Gibraltar; and Scandinavian authors give depths varying from 3 to 50 fathoms. Philippi records it as found in the South-Italian tertiary strata.

This species was discovered by Lister at Guernsey, which locality (as well as Norway) Linné quotes in the 'Systema Naturæ.' Clark says "the animal is shy and apathetic; the locomotion consists in screwing the shell on its axis, and turning it from one side to the other." M'Andrew has seen it sold in Vigo market for eating. The shell is now and then distorted. I have specimens obliquely twisted in the direction of the anterior side, so as to be rather longer than broad, and another which is inequivalve. In one specimen, which had been in the earlier stages of growth tinted with pink rays, the subsequent layers are of a uniform yellowish-white, owing probably to a defect of the special colouring-gland. The cross or longitudinal striæ are easily effaced, and seldom perceptible even in living shells. The largest specimens are found in Shetland.

It is the *Pectunculus capillaceus* of Da Costa, *V. lenti-*

formis of J. Sowerby, and (according to Mörch) the *Cytherea albida* of Bolten.

2. V. LINCTA[*], Pulteney.

V. lincta, Pult. in Hutch. Dors. p. 34. *Artemis lincta*, F. & H. i. p. 431. pl. xxviii. f. 5, 6.

BODY suborbicular, greyish-white: *mantle* having its edges thickened and closely fringed with short tentacular cirri: *tubes* pale yellow, capable of an extraordinary degree of extension, viz. to nearly three times the length of the shell; they are united except at the openings, where they are speckled with flake-white and faintly streaked lengthwise with brown; orifices (as in *V. ovata*) encircled by a ring of purplish-brown and fringed with cirri: *foot* large, broad, and wedge-shaped.

SHELL roundish, with a triangular outline, convex, solid, opaque, of a silky lustre: *sculpture*, very numerous, and flattened but fine, concentric laminæ, imbricated as in *V. exoleta*, and becoming coarser and more erect at the sides; the surface is also covered with the microscopical lines observable in that species: *colour* milk-white, tinged with pale yellow or light brown towards the beaks, which are often of a pink hue: *epidermis* very slight, yellowish-white, disappearing in the adult: *margins* representing in front and at the sides an arc of three-fifths of a circle; that of the anterior side on the upper part is somewhat excavated by the lunule and bluntly angulated; the posterior margin is less rounded, and impressed by an indistinct fold or flexure, which extends from the beak along that side; the dorsal margin is long and slopes obliquely, or is more or less curved to the point of the posterior angle: *beaks* rather prominent and obliquely recurved: *lunule* as in *V. exoleta*, but colourless: *corselet* rather broad and shallow: *ligament* long, horncolour, deeply sunk within the corselet: *hinge-line* rounded or obtusely angled: *hinge-plate* thick, broad, and flexuous: *teeth* the same as those of *V. exoleta*, except that in the right valve the smallest tooth on the anterior side is more laminar and oblique, and the left valve has two similar teeth in the same position to receive the opposite one: *inside* dull chalky-white, all but the scars, which are polished and prismatic; margin thickened and bevelled: *scars* large and well defined. L. 1·3. B. 1·3.

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[*] Licked with the tongue, or polished.

Var. *compta*. Shell smaller, more elongated, with coarser ribs and stronger teeth. *Artemis compta*, Lov. Moll. Scand. p. 39.

Habitat: Sand, sometimes mixed with mud, on every part of the British coasts, from low-water mark to 90 fathoms, occasionally associated with the last species. Var. *compta*. Single valves only, from Skye (Barlee); Shetland (J. G. J.). *V. lincta* is fossil in all our upper tertiaries, from the so-called "alluvial" stratum in Belfast Harbour and the boulder-clay of Wick to the Red and Coralline Crag, as well as in the redeposited Crag-bed of Aberdeenshire. Iceland is its most northern known boundary, and the Ægean and both sides of the Mediterranean the most southern. Philippi noticed its occurrence in the South-Italian tertiaries.

Lister, in his 'Historia Conchyliorum,' well distinguished this species from *V. exoleta*, as "rostro productiore, capillaceis fasciis donatus." It is smaller, more convex and glossy, the laminar ribs are much more numerous, the posterior side is somewhat flexuous, it is destitute of the coloured markings peculiar to the other species, and the umbones are more prominent. The small anterior teeth have more the appearance of short laterals, and may be analogous to those of *Circe*. My largest specimen does not much exceed an inch and a half in length. Monstrosities sometimes occur: a specimen now before me is nearly globular, with consequently a much more abbreviated lunule; and Mr. Norman possesses one which is remarkably inequivalve.

The description of *V. lupinus* in the tenth edition of the 'Systema Naturæ' (although not of the variety "maculis griseis") may possibly have been intended for *V. lincta*; but no locality is assigned to it. Poli adopted the former name for the present species; Lamarck called it *Cytherea lunaris*; Turton *V. sinuata*; and Risso *Arctoë* *nitidissima.* It is not the *V. lupinus* of Brocchi, nor the *V. sinuata* of Gmelin, the latter being a reputed inhabitant of the Nicobar Isles. Turton strangely figured *V. exoleta* for his *V. sinuata,* in the 'Dithyra': his typical specimen of the last-named species is certainly *V. exoleta.* He evidently confounded the two.

B Mantle-tubes nearly united throughout. Shell triangular, slightly impressed with concentric lines; inside margin plain.

3. V. Chi'one*, Linné.

V. Chione. Linn. Syst. Nat. p. 1131. *Cytherea Chione,* F. & H. i. p. 396, pl. xxvii., and (animal) pl. L. f. 8.

Body orange-fleshcolour: *mantle* fringed with a few tentacular cirri at the upper part of the anterior side, and scalloped or furbelowed in other parts: *tubes* rather long, united nearly to their orifices, each of which is surrounded by a circle of cirri; the tubes are of a deep orange-colour with fleshy stripes, and the tips of the cirri are black: *foot* very large, thick, and of a dark pinkish-fleshcolour. (Poli.)

Shell triangularly oval, convex but not tumid, very solid and opaque, highly polished: *sculpture,* numerous and irregular but slight concentric lines or striæ, besides about a dozen marks of growth: *colour* reddish-brown, with often a pink tinge, beautifully variegated by rays of a deeper hue and of different widths, which diverge from the beak in the direction of the anterior side, and extend to the outer margins; these rays are interrupted in the young and become zigzag or exhibit lines of intensely coloured spots (bordering the marks of periodical growth) of various tints from fawncolour to bright orange or sea-green; a younger state has three longitudinal broad white rays, one in the middle, and the others on either side of the beaks: *epidermis* thick, resembling a coat of varnish, covered with close-set longitudinal striæ, which are arranged in series corresponding with the concentric lines of the shell; its surface is wrinkled very minutely, like that of morocco-leather: *margins* rounded on the anterior side, whence they slope obliquely to the front, which is also rounded; posterior side elongated, and somewhat wedge-shaped but likewise rounded; no decided angularity is shown in any part of the contour: *beaks* nearly contiguous, recurved; the umbonal part of the shell is rather protuberant: *lunule* lance-shaped, defined by a distinct furrow, of a deeper colour in immature specimens; lips slightly prominent: *corselet* deep, with shelving sides: *ligament* rather long, thick and strong, horncolour, projecting beyond the corselet: *hinge-line* rounded: *hinge-plate* thick, broad, and flexuous: *teeth*, in the right valve three cardinals, that on the anterior side being blunt, and placed obliquely, or nearly at a right angle to the other two, which diverge, like an inverted V; in the left valve are three cardinals, of which the posterior is long, laminar, and nearly parallel with the hinge-line, and the other two are short, close together, and triangular; this valve has also on the anterior side a pair of small teeth placed nearly at a right angle to the middle pair, and, with the side tooth in the right valve, probably representing anterior lateral teeth; the posterior lateral in each valve is long and ridge-like: *inside* chalky-white, except the *scars*, which are glossy, large and conspicuous, the pallial scar exhibiting a prismatic lustre; margin thickened. L. 2·75. B. 3.

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* A mythological name in Ovid.

HABITAT: Southern and western coasts of England, in sand, at depths of from 12 to 25 fathoms. It is common on the Cornish trawling-grounds. Mr. Lyons told me that he had found it at Milford Haven; Mr. M'Andrew has taken it in Carnarvon Bay; and Mr. Walpole obtained a single valve by dredging off Dalkey in Dublin Bay. It has not been noticed on any part of our northern coasts; and although Sir Cuthbert Sharp included it in a list of shells from the neighbourhood of Hartlepool, published in his history of that place, Mr. Alder has given satisfactory reasons for believing that it was mistaken for *Cyprina Islandica*. It is not rare in the Coralline Crag. Not one of the Scandinavian naturalists has mentioned it; but its range south of Great Britain extends from La Manche (De Gerville) to the Lusitanian coast (M'Andrew) and every part of the Mediterranean, and also to the Ægean (Forbes) and the Azores (Drouet). Brocchi and Philippi have described it as fossil from the middle and newer tertiaries of Italy. It is essentially a southern species.

All we know of the animal is derived from Poli, who called it *Callista coccinea* and devoted three and a half folio pages to its description and anatomy. It must be a gorgeous spectacle. He gives various recipes for cooking it, showing that his gastronomic was as strong as his conchological taste. The shell attains greater dimensions than those which I have given, being occasionally three inches long and three and a half inches broad, or even more.

In the tenth edition of the 'Systema Naturæ' Linné appears to have confounded *V. Chione* with an allied species from tropical seas, the habitat given by him being "in O. Asiatico; forte etiam in Europæo." It is the *Pectunculus glaber* of Da Costa, who quotes Dr. Leigh (the author of the 'History of Lancashire') as his authority for stating that it was got on the coasts of Cheshire; Agassiz called it *Cytherea lævis*, and Leach *Chione coccinea*. The young was described by Lamarck under the name of *Cytherea nitidula*; but his fossil of the same name from Grignon is a different species.

C. Mantle-tubes partly disunited and diverging. Shell triangular, ornamented with concentric laminar ribs, and sometimes cancellated by longitudinal striæ; inside margin notched, except at the posterior side.

4. V. FASCIA'TA *, Da Costa.

Pectunculus fasciatus, Da Costa, Brit. Conch. p. 188, tab. xiii. f. 3. *V. fasciata*, F. & H. i. p. 415, pl. xxiii. f. 3, pl. xxvi. f. 7, and (animal) pl. L. f. 7.

Body suborbicular, compressed, rather thick: *mantle* muscular at the edges, which are fringed with fine white filaments and bordered by a reddish line: *tubes* short, only separate at their extremities, sulphur-yellow with pale-red flaky markings towards the orifices, covered with minute sand-like red points; orifices margined with a fine red line and fringed with white cirri, of which the incurrent (or branchial) tube has about 20, and the other 15; the excurrent (or anal) tube is the smaller, slightly curves upwards, and is furnished with a flexible hyaline valve: *gills* nearly oval, pale brown, the upper being much the smaller and strongly striated on both surfaces: *palps* small, pointed, and triangular, externally smooth, but striated across the inner surface: *foot* thick, moderately strong, lanceolate, and pure white; when at rest it is axe-shaped, and appears amalgamated with the rest of the body.

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* Banded.

Shell triangularly rounded, with a somewhat oblique outline, more or less compressed, very solid and opaque, slightly but not decidedly glossy: *sculpture*, concentric laminar ridges, which are numerous, sharp, close-set, and alternately large and small in the earlier stages of growth, but afterwards become fewer, broader, and equal; the whole surface is crossed by minute, extremely crowded and fine hair-like longitudinal striæ, as in *V. exoleta* and *V. lincta*: *colour* extraordinarily diversified, red, pink, yellow, or brown, of every shade, variegated by rays, streaks, blotches, or zigzag markings disposed in the most lovely fashion, sometimes white: *epidermis* very slight, only apparent at the edges: *margins* obtusely angled on each side, semicircular in front, with a curved dorsal slope and an excavation below the beaks for the lunule: *beaks* small, considerably recurved and diverging, as in the above-named species: *lunule* lanceolate, reddish-brown, defined by a slight but distinct groove, finely and closely striated lengthwise; lips sharp and somewhat prominent: *corselet* long and deep, excavated like a furrow with shelving sides: *ligament* narrow, golden-yellow or horncolour, for the most part concealed within the corselet: *hinge-line* obtusely angular: *hinge-plate* as in all the preceding species: *teeth*, in the right valve three divergent cardinals, the posterior of which is much slighter and longer than the rest, double or grooved lengthwise, and parallel with the hinge-line; the left valve has also three similar cardinals, with the addition of a slighter but longer laminar tooth just inside the ligamental groove on the dorsal slope; laterals indistinct or merged in the hinge-plate: *inside* of a dull hue in the middle, with a deep tinge of purple towards the beaks, and often having a white callosity below the cardinal teeth; margin very finely toothed or crenulated in every part except on the dorsal or ligamental side: *pallial scar* broad and polished, with a narrow and not deep sinus: *muscular scars* distinct, semioval and polished, marked by a few symmetrical lines, which denote the successive shiftings of the muscles. L. 0·8. B. 0·9.

Var. 1. *radiata*. Shell beautifully marked with many reddish-brown rays, which sometimes are alternately large and small, or double.

Var. 2. *raricostata*. Shell smaller and having proportionally fewer ribs.

HABITAT: In every part of the British seas, among nullipores and in gravelly and sandy ground, from the shore to the deepest water. The first variety occurs at Exmouth and Falmouth, in Bantry Bay, off Arran Isle (co. Galway), and in Shetland. The other variety is from the west of Scotland. This common but pretty species is a member of our newer tertiaries, having been recorded by Smith from a postglacial deposit at Ayr, and by Searles Wood from the Mammalian and Red Crag. Havösund, near the North Cape, appears to be in the highest, and the Ægean in the lowest latitude where it has been noticed. It is extensively diffused over the intermediate area. M'Andrew found it living between tide-marks at Gibraltar. According to Brocchi and Philippi, it is a fossil of the Italian tertiaries.

The animal is inactive, and does not seem to be fond of exhibiting itself to curious malacologists. In the 'Cornish Fauna' by Mr. Jonathan Couch it is stated that this species, as well as *V. gallina*, frequently creep into crab-pots in search of the bait. I should scarcely have imagined that any bivalve possessed such an extraordinary habit. Some specimens are more convex than others, and the shell is now and then distorted. The crenulations which border the inside margin resemble minute attached seed pearls. This shell, which I have had figured as a representative of the genus, when "fresh from the sea," but not, like its mythological prototype, "conscious of her beauty," is indeed a lovely thing,

> "Composed with Nature's finest care
> And in her fondest love."

The elegance of its shape, the imbricated arrangement of its sculpture, and the variety and brilliance of its painting are unsurpassed in any other British bivalve. Like many a wild flower, however, it is too common to be thought much of.

There can be little doubt that this was the *V. Paphia* of Linné, who says of it, in the twelfth edition of the 'Systema Naturæ,' "Habitat in O. Lusitanico"; but that name is now applied to a West-Indian shell. The misnomer originated with Gmelin; Pulteney and Montagu in vain protested against it. Brocchi called it *V. dysera,* having mistaken it for a tropical species so named by Linné. The present species is the *V. Brongniarti* of Payraudeau; Risso described it as *V. biradiata,* and by other names; and apparently the *V. Duminyi, V. Busschaerdi,* and *V. Philippiæ* of Requien are also varieties of our shell.

5. V. CASÍNA*, Linné.

V. Casina, Linn. Syst. Nat. p. 1130; F. & H. i. p. 405, pl. xxiv. f. 1, 5, 6.

BODY thick and white (Forbes and Hanley).

SHELL shaped like *V. fasciata,* but not so triangular; it is broader in front, nearly equally solid, and glossy: *sculpture,* concentric imbricated ribs, which in some specimens are broad and flattened, and in others sharp and foliaceous—now and then slightly fimbriated, with very fine impressed parallel lines in the interstices of the ribs—in other respects resembling that of the last-mentioned species; the whole surface is also

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[*] A kind of Nymph; or possibly as a fossil from Monte Casino.

crossed by similar but stronger longitudinal striæ, giving a partially cancellated appearance to young shells, especially on the posterior side: *colour* yellowish-white, occasionally adorned by three or more rays of reddish-brown, which are frequently broken or form irregular lines of spots or zigzag markings: *epidermis* fibrous, brown, thick at the edges but elsewhere rubbed off or not present: *margins* rounded on the anterior side, with a slight shoulder or sharp angular turn behind, and sloping obliquely to the front, which is curved but does not represent so great an arc as in *V. fasciata*, decidedly truncate on the posterior side, and obtusely rounded on the dorsal slope, with a slight indentation below the beaks for the lunule; the posterior margin is indistinctly biangulated: *beaks* recurved, but not so separate, nor the umbones so prominent as in the last species: *lunule* the same, as well as the *corselet*, but the latter is wide and generally not so deep: *ligament* of a similar colour, but more exposed: *hinge-line* and *hinge-plate* also presenting approximative characters: *teeth* undistinguishable, except in the greater size, from those of *V. fasciata*: *inside* chalky-white within the line of the pallial scar, and porcellanous near the margin, which is finely notched in front and on the anterior side (in young specimens also up to the beaks on that side) but smooth on the posterior side: *pallial scar* broad, with a narrow and not deep sinus: *muscular scars* large and distinct. L. 1·6. B. 1·75.

HABITAT: Local, but widely distributed north, east, south, and west, from 5 to 90 fathoms, on a sandy bottom. Capt. Beechey dredged it in 145 fathoms off the Mull of Galloway. It occurs in all our upper tertiaries from the Clyde beds to the Coralline Crag, and Philippi has included it among the fossils of the Sicilian strata. North of Great Britain it has been found on many parts of the Norwegian coast in 15–40 fathoms, and southwards on the coasts of France, Spain, Portugal, Italy, and Algeria, as well as of Madeira and the Canary Isles.

Scarcely anything is known of the animal. The shell is remarkably pretty, but usually almost devoid of colour: specimens from Bantry Bay have the most vivid tints.

They differ considerably in the comparative convexity, and in the ribs being more or less laminar or numerous. I do not regard the *V. reflexa* of Montagu as a distinct variety; for every possible gradation may be seen, connecting it with the typical form. The dorsal margin in this species and *V. fasciata* not unfrequently assumes a serrated appearance, arising from the extremities of the ribs projecting on that side. *V. Casina* may be known from the last-mentioned species by being much larger and broader, the ribs more laminar, delicate, and flounce-like, the longitudinal striæ proportionally stronger, the umbones usually not so prominent, and the colour more sober and less diversified.

The present species is the *Pectunculus membranaceus* of Da Costa, *V. erycina* of Pennant (but not of Linné), and *V. lactea* of Donovan; in its younger state it appears to be the *V. cancellata* of Donovan, *V. discina* of Lamarck, *V. Rustericii* of Payraudeau, and *V. casinula* of Deshayes.

6. V. VERRUCO'SA*, Linné.

V. verrucosa, Linn. Syst. Nat. p. 1130; F. & H. i. p. 401, pl. xxiv. f. 3.

Body very thick, pale yellowish-white: *mantle* freely open from the tubes to the anterior adductor muscles; its edges are serrated or fringed, presenting more or less of a furbelowed aspect: *tubes* short, but well separated, and of a yellowish-white colour, with tawny specks or dark-grey spots, lines, and small blotches; the orifice of the branchial tube is surrounded by a double series of cirri, the largest of which (about twenty in number) are simple; there are only about ten simple and shorter filaments around the orifice of the smaller and upper tube, which is furnished with a prominent conical valve: *gills* nearly circular, free, of a brown colour, coarsely pectinated; the upper pair is, as usual, smaller than the under: *palps* rather small and narrow: *foot* white, moderately long, tongue-shaped and pointed, when at rest axe-shaped; it exhibits no trace of a byssal groove.

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* Warty.

SHELL nearly globose, with a squarish outline in young and half-grown specimens (which are not so convex as the adult), very thick and opaque, of a dull aspect: *sculpture,* strong, laminar, and pretty equally distant concentric ridges, which are imbricated or fold backwards, and become more or less warty or tubercular, especially towards the front margin and sides, besides much smaller intermediate laminæ; these processes as well as the furrows are crossed by numerous but slight and sunken riblets, which radiate from the beaks, and by intersecting the ridges give the shell in its younger state a cancellated appearance, and in its full-grown state the warty or tubercular appearance above described; the entire surface is also covered with the microscopical striæ noticed in other species: *colour* yellowish-brown, with occasionally three or four reddish-brown or purplish rays, which are sometimes broken or zigzag: *epidermis* fibrous, brown, only to be seen on the edges of the valves: *margins* similar to those in the last species: *beaks* small, not prominent, recurved, and slightly separated: *lunule* rather heart-shaped than lanceolate, reddish-brown, defined by a distinct groove, closely imbricated lengthwise; lips prominent and flexuous: *corselet* rather wide, finely imbricated obliquely by a section of the inner lines of growth: *ligament* narrow, horncolour, exposed: *hinge-line* obtusely angular: *hinge-plate* thick, broad, and flexuous: *teeth*, in the right valve three divergent cardinals, of which that in the middle is the strongest and double, the anterior is pointed, and the posterior is slighter and longer than the others, and nearly parallel with the hinge-line; the left valve has also three similar cardinals, the anterior being the smallest, the middle one very thick and slightly cloven, and the posterior resembles the corresponding tooth in the opposite valve, but is stronger; laterals obscure: *inside* chalky-white, with a purple stain on the posterior side; margin notched in front and on the anterior side: *scars* as in the last two species. L. 1·8. B. 2.

HABITAT: Sandy gravel, in 7–20 fathoms, on the south and west coasts of England, in the Channel Isles, Milford Haven, Fishguard, and Pwllheli in North Wales; Oban (J. G. J.); Tyree (Bedford). Laskey says that a specimen was dredged "at Dunbar, of an uncommon size," and it has been found by Macgillivray at Aberdeen, and by others on several parts of the coast in the north of England; but in these cases the shells may have been introduced among ballast. That mode of importing extraneous shells into our sea-ports has happily ceased, owing to the great care taken of late years to prevent the discharge of ballast in or near any tidal harbour. More mischief was caused to navigation than to conchology by previous neglect of the above precaution. *V. verrucosa* is common in the south and west of Ireland. Sussex tertiaries (Godwin-Austen); Wexford beds (Sir Henry James); Coralline Crag (S. Wood). It does not appear to inhabit the north of Europe. South of Great Britain it has been found everywhere, from Brittany to the Ægean and the Canaries, in 2–60 fathoms. Dr. Menke considers a species from St. Vincent to be identical with ours.

The animal is occasionally eaten in some of the Channel Isles, and habitually in county Clare. Weinkauff mentions that it is sold in the market at Algiers. *V. Casina* is its nearest British analogue; but the present species may be always recognized by its more globose form, its coarse and rugged look, the ridges being nodular or warty, and regularly equidistant (instead of numerous in the umbonal part and few on the main portion of the shell), and by the longitudinal striæ being much stronger and more like fine ribs.

Linné compared the shell with his *V. Paphia*, of which he unaccountably supposed this might be a smooth variety. In the 'Gazophylacion' of Petiver it is called the "Cornwalle hearte-cockle with rugged girdles." It is the "Clonisse" of D'Avila, and *Pectunculus strigatus* of Da Costa; and in its younger state it is probably the *V. subcordata* of Montagu, *V. cancellata* of Turton's 'Conchological Dictionary,' and *V. Lemanii* of Payraudeau.

D. Mantle-tubes disunited only at their openings. Shell oval, ornamented with longitudinal ribs and cross striæ, giving partly a tubercular and partly an imbricated appearance; inside margin notched all round.

7. V. OVA'TA*, Pennant.

V. ovata, Penn. Brit. Zool. iv. p. 97, pl. 56. f. 56; F. & H. i. p. 419, pl. xxiv. f. 2, pl. xxvi. f. 1, and (animal) pl. L. f. 6.

BODY suboval, bluish-white interspersed with minute flakes of milk-white or yellow: *mantle* with thickened edges, which are wavy and fringed by numerous white filaments of different lengths: *tubes* very short, of the same length, yellow, united except at the openings, where they diverge a little and are encircled with a row of reddish-brown spots; lips of orifices slightly reflected, and surrounded by purplish or pale-yellow tentacular cirri, each orifice having about 20 of these cirri, which are alternately long and short, and each cirrus having a coloured spot at its base; the excurrent tube is furnished with the usual anal valve: *gills* suboval, very oblique, pale yellow or brown, more striated on the inner than on the outer surface: *palps* short, small, triangular, and striated like the gills: *foot* very long, thick, flexible and extensile, protruded with equal facility on the anterior or posterior side.

SHELL triangularly oval, rather solid and opaque, of a dull aspect: *sculpture*, 40–50 fine but rather broad ribs, which radiate from the beak and more or less dichotomize or branch off in different parts; these ribs are crossed by about half as many more raised and thread-like concentric striæ, and, in consequence of their intersection, a series of oblong tubercles or imbricated scales crests each rib; the cross striæ are often wanting on the front angle of the posterior side; the whole surface is also covered with minute and intermediate transverse striæ, which are stronger and more perceptible in the furrows: *colour* yellowish, with occasionally a tinge of pink or orange variegated by irregular blotches, broken rays, or vandyke markings of reddish-brown: *epidermis* fibrous and slight: *margins* rounded on the anterior side, with a blunter curve in front, wedge-shaped and somewhat produced at the posterior end, on which side an obscure angle appears to run from the beak, and gently sloping on the dorsal side: *beaks* small and blunt, rather prominent but not much recurved or separated:

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* Egg-shaped.

lunule lance-shaped, well defined, sculptured like the rest of the surface, usually of a darker hue; lips prominent: *corselet* wanting: *ligament* narrow, horncolour, wholly exposed: *hinge-line* gently curved: *hinge-plate* broad and even: *teeth*, in the right valve three divergent cardinals, the middle one being the shortest and double, and the others triangular and laminar, the anterior is the highest and longest, and the posterior nearly parallel with the hinge-line; in the left valve are also three cardinals, the middle one triangular and slightly cloven, the anterior the smallest, and the posterior cloven and irregular; laterals indistinct: *inside* dull chalky-white, with often a lilac stain on the umbonal part or posterior side; margin finely notched on all sides: *pallial scar* polished and iridescent, angularly sinuous on the posterior side: *muscular scars* large, roundish-oval. L. 0·55. B. 0·7.

Var. 1. *lutea.* Shell plain yellowish or white.

Var. 2. *trigona.* Shell triangular and having only about twenty ribs.

Habitat: Rather common on a sandy bottom and among nullipores, in the laminarian, coralline, and deep-sea zones. Dr. Leach says that he found it in Dingle Bay, Ireland, "very abundantly under the sand at the lowest tide"; and Capt. Beechey has dredged it off the Mull of Galloway in 145 fathoms. The first variety is from Guernsey, Exmouth, west coast of Scotland, and Shetland, in 15–100 fathoms; and the second has been taken by me at Guernsey. *V. ovata* occurs in all our upper tertiaries, and the variety *trigona* in the Coralline Crag. It has been observed on every coast between Finmark and the Morea, at depths varying from 6 to 135 fathoms. Subapennine beds (Brocchi); South-Italian tertiaries (Philippi); upper miocene strata near Antibes (J. G. J.).

M. Gay finds these shells in the stomachs of *Trigla gurnardus* at Toulon. The colour of some specimens from the deepest water within the line of soundings on our northern coasts is quite as bright, but not so variegated, as that of southern examples from shallow water. Other specimens from each of these localities and habitats are either sulphur-yellow or chalky-white. The young are squarish, and resemble a *Cardium* in shape and sculpture; the fry are round, perfectly smooth, and glossy. Sometimes the shell is twisted, and the longitudinal ribs are not formed in every part, especially towards the front.

If it were not for the links connecting this with allied exotic species, I should have been tempted to separate *V. ovata* generically, and to adopt Leach's reputed name *Timoclea* for it. The very short tubes, oval shell, Cockle-like sculpture, and complete striation of the inside margin are not unimportant characters. It is probably the *V. lusitanica* of Gmelin, and certainly the *Cardium striatum* of Walker, *V. crenulata* of Solander, *V. radiata* of Brocchi (but not of Chemnitz nor of G. B. Sowerby), *V. pectinula* of Lamarck, *V. spadicea* of Renier, and *Pasiphaë Pennantia* of Leach.

E. Mantle-tubes for the most part united. Shell triangular, ornamented with concentric ribs; inside margin notched on all sides except the posterior one.

8. V. GALLÍNA *, Linné.

V. gallina, Linn. Syst. Nat. p. 1130. *V. striatula*, F. & H. i. p. 408. pl. xxiii. f. 4, pl. xxiv. f. 4, and pl. xxvi. f. 9–11.

BODY white: *mantle* having its edges fringed with short fine white filaments arranged in tufts, so that it appears to be sinuous: *tubes* rather slender, and when extended they are about half the length of the shell (according to Clark; but Forbes and Hanley say, "very nearly equalling the breadth of the shell"); they are of the same length and almost united throughout, pale sulphur-yellow or bistre, sprinkled with minute red-brown points, and in some examples slightly tinged with rose at their extremities; both have at their orifices fine red-brown cirri, which in the branchial tube are alternately longer and shorter: *gills* suboval, pale brown: *palps* triangular, striated more distinctly on the inner than on the outer surface: *foot* pure white, rather thick, slightly bent at the heel.

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* Hen.

Shell triangular, rather convex, solid and opaque, more glossy in young than in old examples: *sculpture*, regularly imbricated concentric ribs, which vary much in number and fineness, the course of imbrication being backward; they are now and then forked or become divided towards the posterior end, and are crowded at each side and in front; the whole surface is also covered with extremely numerous and delicate longitudinal striæ which are only perceptible with the aid of a strong magnifier: *colour* pale yellowish-white, usually variegated by three reddish-brown longitudinal rays of different widths, composed of numerous and short broken streaks or spots of the same tint, which sometimes cover the whole of the shell and give it a beautifully stippled (or now and then a vandyked) appearance; occasionally it is not variegated, nor are there any coloured markings on the fundamental hue: *epidermis* extremely slight, only present on the corselet and in young specimens: *margins* obliquely rounded in front, curved upwards on the anterior side, and forming an obtuse angle at that extremity in consequence of the excavation of the lunule, produced and wedge-shaped on the posterior side, which is somewhat flexuous and confined by an acute angle formed by a junction with a long and nearly straight slope on the dorsal side: *beaks* small, recurved and separated; umbonal area prominent: *lunule* varying in shape from cordate to lanceolate, rather deep and defined by a distinct groove, longitudinally striated, sometimes tinged with reddish-brown; lips flexuous, much projecting: *corselet* broad and somewhat deep, with shelving sides, obliquely striated: *ligament* narrow, yellowish-brown, wholly exposed: *hinge-line* obtusely angular: *hinge-plate* thick, broad, and flexuous: *teeth*, in the right valve three divergent cardinals, the middle one being somewhat conical and by far the thickest, the anterior is the smallest but a little higher than the others, and the posterior is very long, slight, laminar, and sometimes double; the left valve has also three cardinals nearly corresponding in size and position with those in the opposite valve; laterals sometimes distinct, being apparently formed by the extension of a ridge, which runs on the dorsal slope outside the posterior cardinal tooth: *inside* dull chalky-white in the middle and towards the beaks, with occasionally a slight stain of purple inside the lips of the lunule; margin crenulated on the ventral and anterior sides, and more minutely on the inside edges of the lunule: *pallial scar* broad and polished, with a narrow and tongue-shaped indentation varying in depth, on the posterior side: *muscular scars* distinct, triangularly oval. L. 1·15. B. 1·3.

Var. 1. *laminosa*. Shell more compressed, and produced on the posterior side; ribs fewer and regular; longitudinal striæ more distinct. *V. laminosa*, Mont. Test. Brit. Suppl. p. 38.

Var. 2. *triangularis*. Shell smaller, and larger in proportion to its breadth.

Var. 3. *gibba*. Shell more ventricose or tumid and rather glossy; ribs numerous, irregular, and at intervals confluent or bifurcating on the posterior side.

HABITAT: Abundant everywhere on sandy ground from low-water mark to 85 fathoms. Var. 1. Nearly equally common; found in Balta Sound between 3 and 5 fathoms and off that coast in the deepest water. Var. 2. Exmouth (Clark); Tenby and Fishguard (J. G. J.). Var. 3. West coast of Scotland, and Shetland. This last variety agrees with the Mediterranean form. Grainger has noticed the present species in the Belfast deposit, and Smith in the Scotch "glacial" beds. Steenstrup has taken it in Iceland; it has been recorded by all the writers on Scandinavian conchology (under the name of *V. striatula*), at depths varying from 3 to 70 fathoms, and by writers on the conchology of other parts of the European seas, from Normandy to both shores of the Mediterranean and the Black Sea (under the name of *V. gallina*), at rather less depths. Brocchi and Philippi have enumerated it as fossil in the Italian tertiaries.

This is not the least of the numerous discoveries for which we are indebted to Lister. Macgillivray has justly remarked that it is a very "instructive" species, because of its tendency to vary. Although the general shape and colouring are the same, an endless diversity occurs. In young and half-grown specimens of the variety *laminosa* the edges of the ribs at the sides are sharp and prickly, as in *V. Casina.* In adult examples of the variety *gibba* the crenulations on the inside margin are apt to become more or less obliterated. I have one from Oban which is twisted and inequivalve.

Availing myself of the candid admission made by the authors of the 'British Mollusca,' that "it is perhaps a matter of controversy whether the *Venus gallina* of Linnæus is specifically distinct from the one so designated by the British writers," I have reunited with that species the *Pectunculus striatulus* of Da Costa. The only difference that I can detect between the shells from the Mediterranean and our own coasts is, that the former have usually (but not invariably) a purplish-brown stain inside at the posterior extremity; this I cannot regard as a sufficient mark of distinction. The only other points of comparison indicated by Forbes and Hanley are common to both forms, as will appear from a critical examination of the characters given in my description of the species and several varieties. Linné named the northern form in his 'Fauna Suecica' *V. gallina*; and although, in the tenth edition of his 'Systema Naturæ,' he mentions the Mediterranean only, in the more complete and universally recognized edition (the twelfth) he first cites the 'Fauna Suecica' and then says, "Habitat in M. Mediterraneo, Norvegico, Asiatico." His diagnosis would include both the northern and southern forms. Müller, in his 'Zoologiæ Danicæ Prodromus,' describes the Scandinavian shell as *V. gallina.* I am aware that, according to Deshayes, the siphonal tubes in specimens which he examined on the Algerine coast are much shorter than they have been stated to be in ours, and diverge considerably; but there is a discrepancy between the accounts published by Forbes and Hanley on the one hand, and by Clark on the other, as to the length of the tubes, and a variation with respect to the extent of their divergence is shown in the figures of Poli and Deshayes. The cirri which fringe the orifices of the tubes appear to be as numerous and conspicuous in the one form as in the other. Many unnecessary names have been bestowed on this common species and its variety *laminosa*. I have noted ten, besides those above mentioned. The *V. pallida* of Turton is not even a variety: the outer layers have been dissolved by muriatic or some other acid; and the types are "doctored" shells, such as unscrupulous dealers sell to ignorant collectors. All specimens have longitudinal striæ. My description of the teeth in ordinary examples will explain the seeming peculiarity in the dentition of Montagu's *V. laminosa*, as noticed by Forbes and Hanley.

V. dysera of Born and Chemnitz (but not of Linné), one of the many "ben trovato" discoveries of Laskey, is West-Indian. It is the *V. cingenda* of Dillwyn. *V. granulata* of Gmelin, *V. Paphia* of Linné (according to modern authors), and *V. circinata* of Born (*V. Guineensis*, Montagu) may be classed in the same category of spurious species. *V. subrhomboidea* of Montagu is apparently the adult of *Petricola lithophaga*, Retz,—his *Mya decussata* (*P. Ruperella*, Lamarck) being certainly the younger state of that shell: this species has not been authenticated as British, although it is rather common in the Mediterranean and the west of France; Mr. J. D. Humphreys's collection of Irish shells contains a specimen found by him in Cork Harbour, but I have reason to suspect that it came from a piece of ballast stone.

Genus II. TA'PES *, Mühlfeldt. Pl. VI. f. 6.

Body oval or oblong: *mantle* having its edges plain: *tubes* more or less united: *foot* usually furnished with a byssal groove.

Shell triangular or rhomboidal, rather solid, grooved concentrically but not deeply: *lunule* lanceolate or indistinct: *teeth*, three cardinals, which are erect and slender, and an obscure lateral (as in the other genera) in each valve; inside margin plain.

I must confess that this is an unsatisfactory genus. The passage from *Venus striatula* to *T. aureus* and thence to *T. virgineus* makes one distrust the character derived from shape; and neither of the two last-mentioned species is known to be byssiferous. The only evident marks of distinction that I can find are the mode of sculpture and the slender and nearly parallel teeth: the general configuration and aspect of the shells may also assist us in recognizing the species. It was named *Pullastra* by the late Mr. George Sowerby. Mörch and Chenu have treated *Tapes* and *Pullastra* as different genera, but without assigning any reason. It is comprised in the genus *Venerupis* of Lamarck. Τάπης being masculine, that gender must of course be applied to the species.

1. Tapes au'reus †, Gmelin.

Venus aurea, Linn. Syst. Nat. (ed. Gmel.) p. 3288. *T. aurea*, F. & H. i. p. 392, pl. xxv. f. 5.

Shell triangular, convex, moderately solid and opaque, more or less glossy: *sculpture*, flattened and slightly imbricated concentric ribs, or bands divided by shallow and oblique grooves, which are occasionally forked towards the posterior end, besides a few irregular longitudinal lines or scratches, and the same numerous microscopical striæ which have been already noticed in several species of *Venus*: *colour* yellowish-white with a golden tint, mostly variegated by several broken rays, or marbled with zigzag streaks or blotches of reddish-brown or light purple, sometimes of a uniform pale yellow or milk-white: *epidermis* horny, usually retained only on the lunule and corselet: *margins* obliquely rounded in front, and more sharply curved on the anterior side, produced or wedge-shaped at the posterior end, which is also curved with a gradual and rounded slope on the dorsal or ligamental side: *beaks* small, slightly recurved, and close together; umbonal area rather prominent: *lunule* lanceolate, not deep but distinctly excavated and defined by a separating line or groove; it is usually stained with purple or of a darker hue than the prevailing colour; the lips do not project: *corselet* narrow and indistinct, sculptured in the same way but not so strongly as the rest of the shell: *ligament* rather narrow, yellowish-brown, wholly exposed, contained in a groove between the dorsal margin and the *hinge-line*, which is obtusely angular: *hinge-plate* short, thick, and flexuous: *teeth*, in the right valve three cardinals, of which those in the middle and on the anterior side are erect, double, and but slightly divergent, and the posterior is smaller and triangular; the left valve has the same number of cardinals, but the smallest is on the anterior side, and the other two are erect, double, and nearly straight; laterals on the anterior side sunken but distinct: *inside* rather glossy, tinged with orange and often having a purple stain at the hinge: *pallial scar* broad and iridescent, deeply sinuous on the posterior side: *muscular scars* triangular, large, and deep. L. 1·3. B. 1·5.

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* From the ornamentation of the shell resembling that of tapestry.

† Golden.

Var. 1. *quadrata*. Shell compressed, and having a squarish outline owing to the dorsal margin being straighter.

Var. 2. *ovata*. Shell more compressed and produced at each end.

Habitat: Southern and south-western coasts of England and Ireland, as well as the Channel Isles, in sandy gravel, at from 3 to 18 fathoms. Cullercoats and Whitburn (Alder, fide J. H. F. and Abbes); Tenby (Lyons); Pwllheli (M'Andrew); Belfast (Hyndman); Lough Strangford (Dickie); Clyde district (Smith and others); Jura Isle (Bedford). It occurs in a fossil state at Belfast and in the Sussex tertiaries and Mammalian Crag. Var. 1. Cork (Humphreys). Var. 2. Bantry Bay and Falmouth (J. G. J.). Two other varieties were found by Dr. Turton in a semifossil state imbedded in blue clay at Clontarf near Dublin. One of them he described and figured in his 'Conchological Dictionary' as *Venus ænea,* and the other as *V. nitens.* These last are much smaller and thinner than the typical form, and may belong to some of Lamarck's species from the Mediterranean which have been carved out of *T. aureus.* Clark referred Turton's varieties to *T. virgineus,* and he questioned if that and *T. aureus* were not the same species. Sars has taken the ordinary sort of a large size by dredging off the Loffoden Isles; and Lovén, Asbjörnsen, Danielssen, and Malm have also recorded it from the Scandinavian coasts, at depths varying only from 5 to 10 fathoms. South of Great Britain it is found everywhere as far as the Ægean, where Forbes took it in 4–10 fathoms; Middendorff gives the Black Sea as a habitat. It is strange that the animal of a species so common as this on many of our shores should never have been described or noticed. I hope the "hiatus valde deflendus" will soon be filled up, with others of the same kind. The shell, which is very pretty, was figured by Lister as English. In Turton's collection is a monstrosity which he mistook for the *Venus sinuosa* of Pennant. It has an oblique fold extending from the umbonal area to the front towards the posterior side. I possess another distortion which is less flexuous.

The present species appears to be the *Venus læta* of Poli, the animal of which he has described as follows:—Body whitish: *mantle* having its edges waved and fringed: *tubes* of unequal size, rather wide, united for three-fourths of their lengths; orifices cirrous, and encircled with reddish-brown spots, the surface of the tubes being frequently marked in the same way. Lovén considers it the *V. literata* of the 'Fauna Suecica,' but not of the 'Systema Naturæ.' Gmelin and Lamarck made each three species out of the present. It is the *V. nebulosa* of Solander and Pulteney, and *Capsa deflorata* of Leach.

2. T. VIRGI′NEUS *, Linné.

Venus virginea, Linn. Syst. Nat. p. 1136 (according to modern authors).
Tapes virginea, F. & H. i. p. 388, pl. xxv. f. 4, 6.

BODY pale yellowish-white or cream-colour: *mantle* having its edges dentate on the anterior side, sinuous in front, and scalloped on the posterior side, with a few short yellow filaments at each end: *tubes* united for three-fourths of their length, and separate for the other fourth towards their extremities; their colour is delicate pale lemon, tinged with reddish-brown at the bifurcation, and often tipped with purple; they are of the same size; the incurrent tube has its orifice truncate, and fringed with 14 pointed cirri, which are alternately large and small, the former being marked at their bases on each side with a patch of bistre, and the latter being white; the excurrent tube curls upwards as in other species, and, in consequence of its outer edges being a little inflected, does not appear truncate; this tube has 16 short white cirri at the orifice, which is encircled by a fine reddish-brown line; the tubes when extended do not measure more than half the breadth of the shell: *gills* nearly circular, pale drab, hung very obliquely; the under pair are at least double the size of the upper, and are strongly marked across by the vessels of circulation: *palps* subtriangular, short, and distinctly striated: *liver* apparently small and pale green: *foot* thick and fleshy, not much bent, but flexible and capable of being attenuated to a fine point; it has no byssal groove.

SHELL rhomboid-oblong, moderately convex, solid and opaque, polished and rather glossy: *sculpture* flattened ribs as in the last species, but they are less regular and often wanting on the umbonal area and consequently in young specimens: there are occasionally a few obscure longitudinal lines, and invariably the microscopical striæ: *colour* yellowish-white, often painted with two or three reddish-brown or purplish rays of different widths, which are seldom entire, being generally interrupted and divided into streaks, zigzag markings, or spots of a most diversified kind; the rays frequently appear white, owing to the greater breadth of the darker bands; some specimens, as in *T. aureus*, are of a uniform pale yellow or milk-white: *epidermis* horny, rubbed off in nearly every part: *margins* obliquely but not much rounded in front, sharply curved and produced on the anterior side, behind which the line from the beaks is nearly straight, produced and wedge-shaped on the posterior side, which is obliquely truncate and ends in a blunt point, straight on the dorsal side in the young but sloping gradually and with a slight curve in the adult: *beaks* small, somewhat inflected, and close together; umbonal area not prominent: *lunule* lanceolate, longer than in *T. aureus* but similar in other respects: *corselet* indistinct: *ligament* rather long, yellowish-brown, wholly exposed, contained in a marginal groove: *hinge-line* and *hinge-plate* as in the last species: *teeth*, in the right valve three erect cardinals, of which the posterior is the smallest, triangular, and set obliquely, the middle cardinal is the largest and double or cloven; the left valve has the same number of cardinals, the smallest of which is on the anterior side and set obliquely, and the other two are double; laterals indistinct: *inside* rather glossy, with a purplish or orange tinge towards the beaks in bright-coloured specimens: *scars* as in *T. aureus*. L. 1·6. B. 1·9.

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* Virgin.

Var. 1. *Sarniensis*. Shell thicker, less produced at both ends and consequently of an oval shape. *V. Sarniensis*, Turt. Dith. p. 153, tab. 10. f. 6.

Var. 2. *elongata*. Shell more produced and pointed at the posterior end, being consequently more oblong and broader in proportion to its length.

HABITAT: Every part of the British coasts, in sand and among nullipores, from the shore to 145 fathoms, at which latter depth it was dredged by Capt. Beechey off the Mull of Galloway. "Garnsey" was the first recorded locality, as appears from Lister's 'Historia Conchyliorum.' It occurs in all our upper tertiaries from the Belfast deposit (Grainger) and glacial beds at

Bushbury Hill near Wolverhampton (Rev. W. Lister) and Great Yarmouth (Rose) to the Coralline Crag. The variety *Sarniensis* has been found in the Channel Isles and south of England, on the Irish coasts, and at Loch Carron and Lerwick, with the usual form. Var. 2. Bantry Bay, west coast of Scotland, and Lerwick (J. G. J.); Larne, co. Antrim (Hyndman). Its extra-British distribution includes Upper Norway (10–30 fathoms) and the Lusitanian coasts, Mediterranean and Ægean (shore to 30 fathoms); it appears to be more a southern than northern species.

The elegant shape of this shell and its bright and variegated (often particoloured) painting help to redeem a collection of our native Testacea from the common opprobrium that they are poor and dingy compared with foreign shells. Not in their form alone, but

> . . . . "in the effusive warmth
> Of colour mingling with a random blaze,
> Doth beauty dwell."

Specimens are found of larger dimensions than those above described. I have one 2 inches long by 2½ inches broad. The fry are square and perfectly smooth. Distortions are not common, unless the variety *Sarniensis* may be so regarded. In one specimen of this sort the right valve has an obscure and broad furrow running from the beak in the direction of the front margin. Philippi states that the animal is eaten at Naples and in Sicily, and is called by the lazzaroni "vongola."

T. virgineus is oblong, and *T. aureus* triangular. The present species is also distinguishable by the ribs being partly obliterated.

Although it is most unlikely that this can be the *Venus virginea* of Linné (described as resembling *V. decussata*, but more round and inhabiting *India*), it has so long gone by that name, that it would be unadvisable to change it. It is probably his *V. læta.* Dale called it *Pectunculus fasciatus*; and this name has the precedence of all others. I will adduce a few out of the numerous synonyms published by different authors: *V. edulis,* Chemnitz; *V. rhomboides,* Pennant; *V. Beudantii,* Payraudeau; and *V. virago,* Lovén. In its younger state it appears to be the *V. nitens* of Scacchi, but not of Turton.

3. T. PULLAS'TRA*, Montagu.

Venus pullastra, Mont. Test. Brit. p. 125. *T. pullastra,* F. & H. i. p. 382, pl. xxv. f. 2, 3, and (animal) pl. L. f. 5 & 5 *a.*

BODY thick, oblong, greyish, yellowish, or very pale bluish-white, sometimes tinted with pink: *mantle* having wavy or jagged edges, which project a little beyond the valves; the indentations or folds are stronger at the sides than in front; within the margin are a few scattered white tentacular papillæ: *tubes* nearly equal in length and diameter, the upper being a trifle longer than the lower, but not quite so large and more conical and contracted at the opening; they vary in length from being only one-half to quite as long as the shell is broad; the upper serves for excretal and the lower for alimentary purposes; both are cylindrical or funnel-shaped, and joined together until about one-fourth of the distance from the orifices, where they diverge, the upper curved backwards and the lower forwards; they are closely wrinkled across, and the upper or outer third portion is irregularly traversed with brown streaks or lines; the orifice of each tube is tinged with brown of various shades, red, orange, or flake-white, and fringed with short finely ciliated filaments, those of the upper tube being plain, and the other set arranged in a double row; the inner row consists usually of a few only, which are erect and longer than the outer row, and branched or studded at their sides with short points, like the gills of some Nudibranchs; the outer row is twice as numerous, very much shorter, and folded outwards; the edge of the lower orifice is considerably expanded, like a bell, when the animal is feeding: *gills* pale brown; the upper pair do not cover the lower, and they are decussated on both surfaces by the network of the circulatory vessels: *palps* small, triangular, striated on the inner, and smooth on the outer surface: *foot* muscular, slightly bent or geniculated, and lance-shaped.

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* A pullet.

SHELL rhomboid-oval, moderately convex, solid and opaque, not so glossy as the last species: *sculpture*, numerous and close-set flattened concentric bands, which are divided by faintly impressed lines, so that the shell appears to be grooved or tooled rather than ribbed; these bands occasionally dichotomize or branch off, and are much stronger and more raised (becoming laminar) on the posterior side; they are crossed by fine, irregular, but equally numerous longitudinal striæ decussating the surface; the microscopical markings are also present: *colour* yellowish-white, often variegated by reddish-brown rays, zigzag streaks, or blotches of every conceivable width, shade, number, and form, sometimes tinged with purple, umber, or the darkest brown, occasionally yellowish or pure white: *epidermis* horncolour, fibrous, seldom persistent in any part: *margins* nearly straight or but little bent in front, trending upwards with a sharper curve to the anterior end, which is rounded and terminated behind by an excavation for the lunule, produced and obliquely truncate at the posterior side, the end of which is rounded, straight and horizontal on the dorsal side in the young but sloping gradually in the adult: *beaks* small, somewhat recurved, and close to each other; umbonal area rather prominent: *lunule* lanceolate, deep but not very distinct, nearly smooth, mostly of a darker hue: *corselet* narrow, defined on each side by the edges of the ligamental groove: *ligament* rather long, yellowish-brown or horncolour, wholly exposed and projecting beyond the lips of the corselet, contained in a marginal groove, minutely striated across when fractured, showing its compact structure and tendinous tissue: *hinge-line* representing a very obtuse angle: *hinge-plate* solid but not very broad except under the beak, where it forms a kind of shelf: *teeth*, in the right valve three erect, slender, parallel, and nearly equal-sized cardinals, the posterior of which is rather the smallest, and the other two are double or bifid at the crown; the left valve has the same number and kind of cardinals, the anterior being the smallest, and the others double; laterals ridge-like and indistinct: *inside* towards the beaks porcellanous, and covered with minute and irregularly confluent tubercles, pure white or stained with purple at the hinge or posterior side: *pallial scar* broad and polished, deeply and widely sinuous at the posterior end: *muscular scars* triangular, large, and also polished. L. 1·5. B. 1·7.

Var. 1. *perforans*. Shell more or less distorted, and either longer, broader, or shorter than usual, or having the anterior margin abruptly truncate. *Venus perforans*, Mont. Test. Brit. p. 127, t. 3. f. 6.

Var. 2. *ovata*. Shell more convex, longer, and contracted at each end.

Var. 3. *oblonga*. Shell much broader, being more produced at each end.

Var. 4. *plagia*. Shell more produced at the posterior side, which bends upwards (as in *Lutraria elliptica*, var. *oblonga*), the anterior margin having a corresponding curve and being obliquely truncate. *Venus plagia*, Jeffr. in Ann. Nat. Hist. vol. xix. p. 313.

Habitat: Equally common and diffused with *T. virgineus*; but it is usually littoral, living in muddy gravel or sand, and is seldom found below 7 or 8 fathoms. It occurs in the Clyde, Belfast, and Sussex tertiary beds. The *T. perovalis* of Searles Wood from the Coralline Crag scarcely differs from the present species. Var. 1. In crevices of rocks, and in deserted holes of *Pholades* and *Saxicava arctica*, generally attached by a byssus, from Unst to Jersey. Var. 2. Exmouth (Clark); Cork (Humphreys). This is analogous to the variety *Sarniensis* of the last species. Var. 3. Cork (Wright); Bundoran, co. Donegal (J. G. J.); Shetland (Barlee). Var. 4. Lerwick and Deal Voe (J. G. J.). *T. pullastra* inhabits the coasts of Norway, South Sweden, and Denmark, and those of the north and west of France; and (as *Venus geographica*, which I consider a variety of the same species) it is spread over all the sea-bed lying between Gibraltar and the Morea. It is also one of the Uddevalla fossils.

According to Montagu these shells are called "pullers" or "pullets" in some parts of Devonshire. De Gerville says that the people of La Manche sell this kind for eating, under the name of "Coque." Its vulgar appellation in Shetland is "Kullyak," being probably derived from the Norse word "kulle," a haddock, this mollusk being a favourite bait for fish. It is also not an unpalatable article of human food. I tasted one raw at the recommendation of Dr. Edmondston, and fancied that its flavour was not inferior to that of an oyster. He indeed gave this the preference. The gills appear to be aërated by means of the mantle-edges, which are always swaying about with a wave-like motion. The fry are shaped like the adult, but are quite smooth and glossy. My largest specimen was found by Edward Forbes in Skye, and is 2 inches long by 2¼ inches broad. Monsters of another kind occasionally make their appearance, being distorted in one way or another, chiefly in being twisted or inequivalve.

This shell differs from *T. virgineus* in being oval instead of oblong, less glossy and never polished, and in the ribs being much finer, more numerous, and decussated by longitudinal striæ. Forbes was the first who publicly repudiated (in his 'Malacologia Monensis') the claims of *Venus perforans* to specific distinction, justly considering it to be only a variety of *T. pullastra*. Nine years previously, when I was also a juvenile conchologist, I formed a similar opinion; and in the mean time Clark made the excellent observations, which were transferred from his note-book to the pages of the 'British Mollusca,' embodying the views of the consentaneous triumvirate. The normal coloured markings are present in some specimens of this form which had been immured all their lives in rocks and secluded from the garish light of day. One living example, which occupied the former burrow of a *Pholas dactylus*, has a group of *Serpula triquetra* attached to it on the posterior side, the hole being large enough to contain both. This is a confirmatory proof that *T. pullastra* does not perforate any hard substance.

Although Mr. William Wood figured this species in the 'Linnean Transactions' (vol. vi. t. 17. f. 13, 14), and showed that the structure of its hinge was different from that in *T. decussatus*, he did not assign any specific name to it. I believe our shell is the *Venus literata* of Linné and Poli; but that name is now used for a tropical species. As I have before remarked, the *V. geographica* of Chemnitz is the southern form or variety, to which the *V. eremita* of Brocchi, *V. bicolor*, *V. catenifera*, *V. retifera*, and *Venerupis nucleus* of Lamarck, and the *Venus Tenorii* of Costa may also be referred.

4. T. DECUSSA'TUS *, Linné.

Venus decussata, Linn. Syst. Nat. p. 1135 (according to modern authors).
T. decussata, F. & H. i. p. 379, pl. xxv. f. 1.

BODY thick, oval, very pale cream-colour or greyish-white; margins having their edges scalloped or fringed with white: *tubes* subcylindrical, separate throughout, and (at the will of the animal) diverging in various directions, of the same length, which when they are extended is equal to the breadth or transverse admeasurement of the shell; they are at times greatly distended; their colour, to within a quarter of an inch from the orifices, is pale yellowish-white, interspersed with minute flakes of pure white, streaked or speckled near the orifices with confused tawny-yellow, reddish-, or dark-brown markings; orifices encircled with cirri, that of the lower (or alimentary tube) having about 12 long and as many alternate shorter ones, and the upper (or excretal) tube being furnished with about 20 equal-sized ones; these cirri are of a brown or bistre colour: *gills* suboval, pale brown sprinkled with minute darker points; as usual, the upper pair is the smaller; they are more strongly pectinated on the inner than on the outer surface: *palps* very small for the size of the animal, triangular, and striated like the branchial laminæ: *foot* large, white, muscular, lanceolate, bent, and furnished with a byssal groove.

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* Intersected by lines crosswise.

Shell having a general resemblance to *T. pullastra*, but distinguishable by the following characters. It is usually not so convex, and less broad (or shorter from one end to the other): *sculpture* much coarser, the longitudinal striæ being quite as strong as the transverse ribs and often more raised; the surface is thus reticulated, and marked (especially on the posterior side) by rows of tubercles: *colour* of a more sombre and uniform hue, mostly yellowish and variegated with rays and zigzag streaks or spots of dark or light brown: *dorsal margin* more straight and the posterior slope decidedly truncate. L. 1·75. B. 2.

Var. *quadrangula*. Shell smaller, square-shaped, and more convex.

Habitat: Muddy gravel and sand at low-water mark, with *T. pullastra*, on the shores of our southern and western counties, Wales, and Ireland. Cheshire coast (Hall); Scarborough (Bean); Northumberland and Durham (Alder); Berwick (Johnston and Maclaurin); Clyde district (Eyton); Oban (J. G. J.); Sound of Iona (Bedford); Skye (Forbes); Aberdeen (Macgillivray); Shetland (Forbes and M'Andrew). Var. Cork (Humphreys); Bantry Bay (Barlee). This species is subfossil in the Loch of Spynie, and in the "Kjökkenmoddings," Morayshire (Gordon): fossil in the Scotch glacial beds (Smith); Belfast "alluvial" deposit (Hyndman and Grainger); Sussex tertiaries (Godwin-Austen). It also occurs with shells of Arctic species in the newer pliocene strata of Bohuslän (Malm), Uddevalla (J. G. J.), and Christiania (Sars); and with shells of southern species in the Sicilian tertiaries (Philippi). It has not been noticed in a living or recent state by any writer on the northern or Scandinavian fauna; but it is universally common southwards as far as the Ægean and probably Senegal.

The shell was well figured by Lister as English. He noticed the purplish-violet stain inside, and inquired whether the dye of the ancients could have been procured from bivalves as well as from univalves. This question has never been answered by any physiologist or antiquary. He also mentions that the shells are called "purrs" in some parts of England; Petiver and Dale give the same provincial name. According to Collard des Cherres, the Breton designation is "palourde," which is also applied in that province to *Pecten maximus*. M. Gay informs us that it is known at Toulon as "clouvisso." The animal makes a favourite dish in continental seaports; and Mr. Dennis writes me word that both this and *T. pullastra* are eaten in Sussex. It has been observed by Mr. Rich to be more tenacious of life than *T. pullastra*. He kept some of the present species alive in fresh water for eight or nine days, but none of *T. pullastra* survived for half that time. He also found the colour of the shells of both these species, when put into hot water or near a fire, to change from dark purplish-brown to a brick-red hue. Montagu justly remarked that the siphons differ from those of *T. pullastra* in being divided to their origin; but he was mistaken in supposing that both tubes were protruded in search of food. Mr. Clark says, "This species is much more common than the *P. pullastra*; they live together in the same shingles, and have precisely the same habitudes; notwithstanding this community they are very distinct." His opinion on the last point is the more valuable because he was by no means a species-maker. The young of *T. decussatus* are nearly square, while those of *T. pullastra* are oblong.

My largest specimen measures two and a half inches in length by three inches in breadth: others are twisted and irregular or keeled on the posterior side.

The habitat assigned by Linné to *Venus decussata* is "O. Indico"; but the description in the 'Mus. Ulr. Reg.,' as well as those in the 10th and 12th editions of the 'Syst. Nat.,' suit the European shell which now bears the above specific name. Specimens from the Indian Ocean cannot be distinguished from this in form, sculpture, or colour, although they are called *T. Indica*. The synonyms are numerous; I have noted about a dozen. If the name could now be changed, I would suggest the adoption of that proposed by Da Costa, viz. "*reticulatus*." Adanson's "le Lunot" appears to be the present species, and not *T. pullastra*.

Genus III. LUCINOP'SIS *, Forbes and Hanley.
Pl. VII. f. 1.

Body roundish: *mantle* having its edges furbelowed or puckered: *tubes* separate throughout.

Shell globose, thin, striated concentrically: *lunule* indistinct: *teeth*, in the right valve three, and in the left valve two cardinals, besides the usual lateral in each valve: *pallial scar* exhibiting a remarkably deep sinus.

To the learned authors of the 'British Mollusca' is the credit due of proposing and establishing the present genus, which connects the *Veneridæ* with the *Tellinidæ*, and almost forms the type of an intermediate family. In the structure and position of the siphonal tubes it is more like *Tellina* than *Venus*; and in the orbicular form of the shell, as well as in the number and shape of the teeth, it differs from any genus in either of the above-mentioned families. The microscopical striæ, characteristic of the shells of the *Veneridæ,* are absent in *Lucinopsis.* In its general appearance this genus agrees with *Lucina*; but the recurved beaks, sinuation of the pallial scar, and length of the tubes offer conclusive reasons for their separation.

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* Having the aspect of the genus *Lucina*.

Lucinopsis unda'ta *, Pennant.

Venus undata, Penn. Brit. Zool. p. 95, pl. 55. f. 51. *L. undata,* F. & H. i. p. 435, pl. xxviii. f. 1, 2, and (animal) pl. M. f. 2.

Body milk-white, or of a pale pinkish drabcolour: *mantle* having its edges wavy, or sometimes partially jagged, but never serrated or fringed; ventral opening small: *tubes* more or less divergent, occasionally tinged with orange, conical, capable of being considerably extended; incurrent tube the smaller in diameter, but longer of the two, its orifice margined by a circle of very short and minute dark specks, and fringed with 16–20 white cirri of various sizes and lengths; excurrent tube having its orifice encircled with 12–15 white cirri, which are uniformly short and without the marginal row of dark specks: *gills* pale drab, the upper plates being much smaller than the lower and half overlapping them; pectinations rather fine, but not very distinct: *palps* of the same colour as the gills, fleshy, rather long, triangular, pointed, strongly striated on the outside and smooth within: *foot* of moderate size, white, flat, pointed, not much bent, destitute of a byssal groove, and issuing from the front or ventral side.

Shell almost circular, tumid, semitransparent, rather glossy: *sculpture,* numerous and fine, but irregular, concentric striæ, and occasional lines of growth: *colour* milk-white, with often a yellow or ochreous hue, especially near the beaks: *epidermis* thin, like varnish and slightly iridescent, longitudinally (but very minutely) striated or puckered: *margins* more or less straight on the ventral side in the adult and rounded in the young, regularly curved on the anterior side, excavated below the beaks, obtusely angular at the posterior end, with an abrupt slope or truncation on that side; dorsal or ligamental margin very gently curved in the adult and sloping in the young: *beaks* small, slightly turned towards the anterior side, and nearly contiguous; umbonal area prominent: *lunule* lanceolate, rather deep, but rarely defined by a separating groove: *ligament* long, yellowish-brown or horncolour, projecting beyond the dorsal margin, and conspicuous from the contrast of its colour with that of the shell: *hinge-line* obtuse-angled in the adult, and rectangular in the young: *hinge-plate* solid: *teeth*, in the right valve three cardinals; the middle one short, thick, triangular, and double, crowned with jagged edges or points; the other two laminar, and equally diverging from the central tooth, the anterior being much the longest of all; the left valve has only two cardinals, representing the letter V reversed, the posterior being double, and the other erect and laminar; the intermediate space receives the central tooth of the right valve; the anterior tooth in each valve is elongated or continued in the form of an oblique ridge, which has the appearance of a lateral tooth: *inside* chalky-white; margin smooth and bevelled towards the edges: *pallial scar* broad, removed far from the margin; sinus very large, extending to within one-third of the diameter in the direction of the beaks: *muscular scars* strongly marked, the anterior much longer than the other, which is oval. L. 1·25. B. 1·35.

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* Wavy.

Var. 1. *ventrosa.* Shell smaller and more ventricose.

Var. 2. *æqualis.* Shell equilateral, compressed in front: *beaks* more prominent and central.

HABITAT: Fine and muddy sand, in all our bays and within the line of soundings, at from 3 to 100 fathoms. It is fossil at Belfast, "in vast numbers and very large" (Hyndman and Grainger); Ayr (Smith); Kyles of Bute (Crosskey). Var. 1. Arran I., co. Galway (Barlee); Shetland (J.G.J.). Var. 2. Scilly Isles (Lord Vernon); Bantry Bay (Humphreys); West coast of Scotland (Barlee). This species is distributed from the Loffoden Isles (Sars) to Mogador (R. T. Lowe) and the Ægean (Forbes). South-Italian tertiaries (Philippi).

The animal is sluggish. The tubes of individuals which I examined were very short, although not united. Mr. Clark says that "the siphonal apparatus has the entire aspect of the typical *Tellinidæ*," but that its position differs in being very little posterior to the centre of the ventral range, instead of the tubes being (as is more usual in that family) protruded from the posterior angle. He also remarks that the colour of the animal, when killed by hot water, often changes to the various hues of orange, red, and brown,—a condition which prevails more or less in all the testaceous Mollusca, and particularly in the bivalves. We must look to the carcinologists for an explanation of this phenomenon, remembering the old simile of Aurora:

> "And, like a lobster boil'd, the morn
> From black to red began to turn."

This species is the *Venus inquinata* of Lamarck, *V. incompta* of Philippi, and, according to him, the *Lucina caduca* of Scacchi. Deshayes, in his Catalogue of the Bivalve shells in the British Museum, places it, with a doubt, in his genus *Cyclina*.

Family XIV. TELLI'NIDÆ, Latreille.

BODY oval or oblong: *mantle* fringed with tentacular appendages: *tubes* very long, separate throughout, unequal in length, issuing from a sheath or fold of the mantle: *gills* unequal in size: *palps* large: *foot* tongue-shaped and flexible.

SHELL sometimes inequivalve, triangular, oval, oblong, rhomboidal, or cuneiform, striated concentrically, and in certain kinds also longitudinally or obliquely: *epidermis* generally thin, but existing in all the members of this family: *beaks* incurved, nearly straight: *ligament* external, placed on the smaller side of the shell: *hinge* in each valve furnished with two cardinal teeth (one of which is frequently cloven or double), and, in certain genera and species, with a lateral tooth on each or but one side in either or only in one valve: *pallial scar* more or less deeply sinuous or indented: *muscular scars* distinct.

This large and well-known family differs from the *Veneridæ* in the pallial tubes being invariably long and separate, the beaks being less recurved, and the ligament placed on the smaller side of the shell, and also in having fewer cardinal teeth. The comparative length of the tubes in each individual, caused by their extension or contraction, seems to depend on the will of the animal; sometimes the incurrent, and at other times the excurrent tube is the longer of the two. In families which have these tubes united, there can, of course, be no such inequality. Carpenter has shown that the shells of the *Tellinidæ* are of a solid texture, and that their external and internal layers present appearances of a prismatic cellular structure; he termed these cells "fusiform," and observed that they were arranged in the two layers in opposite directions.

The *Tellinidæ* inhabit sand, and occasionally mud, at all depths; some kinds are littoral.

Poli proposed the name *Peronæa* for the animals of the genera comprised in the present family.

Genus I. GASTRA'NA *, Schumacher. Pl. VII. f. 2.

Body oval, tumid and thick: *tubes* having cirrous orifices.

Shell equivalve, inequilateral, wedge-shaped, ventricose, decussated by concentric ridges or laminæ and longitudinal striæ: *teeth*, one large cloven cardinal and a minute triangular one by its side in the left valve, and two equal-sized divergent cardinals in the right valve; no laterals: *inside* margin smooth.

The solitary species which represents this species in the European fauna may be regarded by some as an aberrant *Tellina*. The generic difference consists in *Gastrana* having a more decidedly cuneiform and ventricose shell, as well as in the greater size of the anterior cardinal tooth in the left valve, and the want of lateral teeth. But all these characters exist in species of the parent or typical genus. The shell of *T. balaustina* is nearly equally convex; *T. squalida* and other species have the anterior cardinal tooth in the left valve as large in proportion to the other tooth; and *T. balthica* has no lateral tooth. However, as I have before remarked, there are no lines of absolute demarcation between any two allied genera; and there may be as good reason for separating *Gastrana* from *Tellina*, as *Tapes* from *Venus*.

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* So named from the turgidity of the shell.

Deshayes proposed in 1845 the name of *Diodonta* for this genus, being (it may be presumed) unaware of Schumacher's publication, which bears the date of 1817. The one selected a European, and the other tropical types; but all are congeneric.

GASTRANA FRA′GILIS *, Linné.

Tellina fragilis, Linn. Syst. Nat. p. 1117. *Diodonta fragilis*, F. & H. i. p. 284, pl. xxi. f. 3, and (animal) pl. K. f. 2.

BODY yellowish-white: *tubes* almost twice as long as the shell is broad, one having eight and the other six rays or points at their orifices; alimentary tube sheathed at its base *foot* rather large (Deshayes).

SHELL triangular, considerably produced at the posterior end, more convex towards the beaks, rather thin but opaque, somewhat glossy when young but afterwards becoming lustreless: *sculpture*, more or less irregular, thin, concentric ridges or laminæ, which are slightly imbricated on the posterior side. besides numerous minute and close-set parallel striæ in the interstices of the ridges; the whole surface is also covered with fine longitudinal striæ which radiate from the beaks, and are three times as many as the transverse ridges, but very much more slight and scarcely raised; where these cross the ridges the crests of the latter are indistinctly beaded: *colour* pale yellowish-white: *epidermis* fibrous, usually worn off and only visible near the beaks and at the edges of newly-formed layers: *margins* curved, but not deeply, in front, nearly semicircular on the anterior side, acutely angular but bluntly pointed at the posterior end, whence there is a long and nearly straight slope backwards: *beaks* small, incurved, and contiguous (frequently becoming worn by attrition): *ligament* strong and prominent, horncolour, annulated at irregular intervals: *hinge-line* obtusely angular: *hinge-plate* thick, reflected outwards on the dorsal side, where it terminates abruptly near the extremity of the ligament: *teeth*, in the right valve two cardinals of unequal size representing the letter V reversed, and receiving between them the larger tooth of the opposite valve; in the left valve two cardinals, that on the posterior side being very large, recurved, irregularly divided by a groove, or double, and the other on the anterior side very much smaller, triangular, and parallel with the hinge-plate: *inside* partially nacreous, stained with yellow near the beaks and on the posterior side: *pallial scar* exhibiting a wide but not deep sinus: *muscular scars* of irregular shape, equal-sized. L. 1·05. B. 1·5.

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* Brittle.

HABITAT: Not uncommon, although very local, in sand, from low-water mark to 12 fathoms. Weymouth (Thompson); Guernsey (J. G. J.); near Tenby (Lyons); coast of Pembrokeshire (M'Andrew); south and west of Ireland (Turton, Humphreys, Battersby, King, and others); Shetland Isles (Forbes, in Brit. Assoc. Rep. 1850). Dr. Turton found it in a semifossil state at Clontarf in Dublin Bay, imbedded in blue clay with *Tapes aureus*. The only northern locality that has been noticed for *G. fragilis* is Drontheim, where Mr. M'Andrew dredged a single valve. The southern localities are very numerous, and comprise all the coasts of the Atlantic from Brittany to Gibraltar, the Mediterranean on both sides, Adriatic, and Ægean. The greatest depth that I can find recorded is 30 fathoms; and it is littoral at Vigo and in the Ægean. Searles Wood has noticed its occurrence in the "faluns" of Touraine, and Philippi in the newer tertiary strata of the south of Italy. This species being common in some parts of the west of Ireland which have been often explored by many of our best zoologists, it is surprising that the animal has not been noticed by any writer on the British or Irish Mollusca, and that it should have devolved on a German conchologist to examine it on the distant shores of Sicily, and on a French savant to investigate its anatomy in North Africa. Their descriptions, however, differ from that of Poli, as well as among themselves. According to Philippi the siphonal orifices are not cirrous; the characters of the animal which I have quoted from Deshayes give the number of cirri which surround the aperture of each tube; while Poli states that the cirri encircling the branchial tube are scarcely perceptible, even by the aid of a lens, and that the mouth of the other tube is plain. The lesser tooth in the left valve is thrown into the shade by its huge companion, and the genus is represented by authors as having only one tooth in that valve. Montagu says that his *Tellina polygona* has, "besides the very large, triangular, bifid tooth, an approximate small one, that might easily be passed unnoticed." I believe that shell was only a half-grown and distorted *G. fragilis*; I have one exactly answering to the particulars and figure given in the 'Testacea Britannica.' The young are more oval, and not so inequilateral. A specimen in my collection contains a small incipient pearl close to the posterior scar. The regularity of sculpture varies in individuals from different localities.

It is the *Tellina striatula* of Olivi, *T. jugosa* of Brown, *Petricola lamellosa* and *P. ochroleuca* of Lamarck, and (in its younger or immature state) his *Psammotæa tarentina*.

Genus II. TELLI'NA *, Linné. Pl. VII. f. 3.

Body oval, compressed: *tubes* slender; orifices cirrous, or plain.

Shell oval, triangular, or oblong, in some species slightly inequivalve, more or less inequilateral, sculptured by concentric laminæ or striæ, and occasionally by longitudinal (or partially by oblique) striæ; posterior side flexuous: *teeth*, two cardinals in each valve; laterals on either side or on one only of each or one valve, but not always present: *inside* margin smooth.

According to Aldrovandus the generic name is derived from the quick growth of the shell. He cites Aristotle as his authority; but the expression of the latter (ὅτι τάχιστα γίνονται τελεῖαι) was used with reference to every sort of shell-fish. Mr. William Wood's work, 'General Conchology,' published in 1815, contains a monograph of all the species of *Tellina* which were at that time known: it is well executed and prettily illustrated. He explained, better than Montagu had done a few years previously, the use of the siphonal tubes, as well as of the linguiform organ usually termed a "foot." As Lamarck observed, the two valves of the same individual are not always perfectly alike; sometimes one valve is more convex than the other. This inequality of size occurs to a certain extent in our *T. crassa* and *T. squalida*. The species are exceedingly numerous, both in a recent and fossil state; according to Chenu there are 220 of the former, and nearly half as many in secondary and tertiary strata. Searles Wood says that "the genus appears as early as the Coral Rag, with some doubtful forms in the Palæozoic Formations." Their shells are of an elegant shape, and often variegated by bright-coloured rays and other markings.

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* The name given by Dioscorides to a kind of shell-fish.

Even this consistent genus has a dozen synonyms, two of them prior, and the rest subsequent to Linné's time.

A. Shell oval, nearly equilateral, concentrically laminated: lateral teeth conspicuous.

1. Tellina balau'stina *, Linné.

T. balaustina, Linn. Syst. Nat. p. 1119; F. & H. i. p. 290, pl. xxi. f. 2.

Body gelatinous, greyish-white: *tubes* clear white and transparent; orifices apparently not fringed or ciliated.

Shell triangularly oval, or inclined to globular, ventricose, thin, semitransparent, rather glossy: *sculpture*, regular, delicate, and but slightly raised concentric laminæ, which are easily rubbed off or broken, more crowded at the sides, besides minute, close-set, parallel striæ in the interstices; the whole surface is also covered with microscopical and excessively fine but irregular longitudinal striæ: *colour* whitish with a faint tinge of yellow, variegated by narrow streaks of a pinkish hue, which radiate from the direction of the beaks and are more conspicuous towards the margins; these rays differ in number and width, and frequently are broken and variously disposed, sometimes two or three being close together, and now and then confluent: *epidermis* thin, filmy and iridescent, imparting to the surface a silky lustre: *margins* semicircular on the anterior side, regularly but more bluntly curved in front, slightly angular on the posterior side, which is flexuous and separated from the rest of the shell by an obscure and broad ridge; dorsal margin short, straight in the young and nearly so in the adult: *beaks* small, incurved, and almost contiguous; umbones somewhat raised: *lunule* lanceolate, deeply incised, with shelving sides: *ligament* short, not very prominent, horncolour: *hinge-line* more rounded than angular: *hinge-plate* slight, of moderate breadth: *teeth*, in each valve two symmetrical, short, erect, and diverging cardinals, the posterior of which in the right valve and anterior in the left valve are bifid or double; laterals, one on each side in both valves, remote and laminar, more developed in the right than in the left valve: *inside* glossy, tinged with orange, microscopically wrinkled and longitudinally lineated: *pallial scar* slight, large, but not extending far into the interior: *muscular scars* well defined. L. 0·75. B. 0·85.

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* Colour resembling that of a pomegranate flower.

Habitat: Rare (in the sense of local), in fine sand, at the undermentioned places and depths: Falmouth, among trawl refuse from about 20 fathoms (Miss Vigors, Mrs. Gulson, and Mr. Cocks); Birterbuy Bay, co. Galway, 18–20 fathoms (Barlee and J. G. J.); Stornoway and Skye, 40–50 fathoms (Barlee); Moray Firth, in deep water (Macdonald); Shetland, 18–78 fathoms (J. G. J.). Fossil in the Coralline Crag (S. Wood). It inhabits every part of the Mediterranean, Adriatic, and Ægean, at from 6 to 50 fathoms, and M'Andrew has dredged it off Madeira and the Canary Isles in 20–25 fathoms. Philippi enumerated it as a Sicilian tertiary shell.

This is one of the much sought-for treasures of the British conchologist, apparently scarce, but found in many parts of the North Atlantic,

> "All scatter'd in the bosom of the sea."

The market-price of perfect specimens may be said, in mercantile phrase, to "rule" from £2 to £5. Separate valves and fragments have not unfrequently been brought up in the dredge on the eastern coasts of Shetland, at a considerable distance from land, and far beyond the course or influence of the Gulf-stream. The fry are triangular, and in shape not unlike those of *Lucina borealis*. My largest specimen (a single valve) is about an inch in breadth. The dimensions of British examples greatly exceed those of any from the Mediterranean; and they can always be thus distinguished. Although the present species may be considered a southern form, it is a striking illustration of the fact that the development of size in individuals of the same species in the Mollusca increases northward. Lilljeborg and Sars have made similar observations with regard to the Crustacea and other Invertebrata which are common to northern and southern latitudes. An explanation (although perhaps an imperfect and unsatisfactory one) of this law has been offered in the 'Introduction' to my first volume, p. xxxii.

The synonyms of this pretty species are few and obsolete. I am aware of two only, viz. *T. orbiculata,* Renier, and *T. serratula,* Chiereghini.

2. T. CRASSA*, Gmelin.

Venus crassa, Linn. Syst. Nat. (ed. Gmel.) p. 3288. *T. crassa,* F. & H. i. p. 288, pl. xx. f. 1, 2.

BODY yellowish-white: *mantle* thick; edges closely fimbriated: *tubes* funnel-shaped and long; orifice of each narrow, and fringed with 6 short tentacular cirri; the excretal or upper tube in an individual examined by me was three or four times the length of the other tube; mouth of the alimentary tube much contracted and like a snout in shape: *gills* nearly circular, of a very thin texture; lower pair twice the size of the upper; both are coarsely but not distinctly pectinated: *palps* narrow, slender, pointed, of an elongated triangular form, quite smooth externally, but conspicuously striated on the inner side: *liver* dark brownish-green: *foot* very large.

SHELL obtusely triangular rather than oval, compressed, thick, opaque, moderately glossy; the left valve is somewhat larger and deeper than the other: *sculpture,* numerous strong, threadlike, concentric ribs, which are more crowded and become laminar at the sides also in the young; the narrow interstices of these ribs are impressed with finer parallel striæ, and crossed by deeper, more regular, and close-set longitudinal striæ, none of which, however, are visible except by the aid of a magnifier: *colour* the same as in the last species: *epidermis* fibrous, yellowish-brown, slight, and effaced in nearly every part by continual friction: *margins* curved in front, and obtusely angular with rounded points at each end; posterior side decidedly flexuous, especially in the right valve: *beaks* small, incurved, and contiguous; umbones projecting, but not disproportionately convex: *lunule* deep, lanceolate, elongated, and of a reddish-brown hue: *ligament* long, rather prominent, dark horn-colour: *hinge-line* curved: *hinge-plate* thick, broad, and flexuous: *teeth* similar to those in *T. balaustina*, but stronger; the anterior lateral in the right valve is very large and conspicuous: *inside* highly glossy and nacreous, longitudinally marked towards the margin with faint and indistinct lines, and sometimes streaked irregularly from the hinge to the centre with bright pink or rosecolour: *pallial scar* well defined, large, extending across nearly to the anterior adductor muscle, and slightly lineated in the same direction: *muscular scars* deep, particularly that of the anterior adductor, which is pear-shaped. L. 1·8. B. 2·1.

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* Solid.

Var. *albida*. Shell whitish and without coloured rays.

Habitat: All our sandy coasts, from the Shetland to the Channel Isles, from low-water mark to 55 fathoms. Var. 1. Lerwick (Barlee and J. G. J.). This species is fossil at Ayr (J. Smith), and in the Mammalian, Red, and Coralline Crag (S. Wood). Nyst has recorded it from the Belgian Crag, and Philippi from the Sicilian upper tertiaries. It is not uncommon in the North Sea from Drontheim (Sars) to the Bohuslän district (Lovén and Malm), and south of Great Britain from Normandy (Bouchard-Chantereaux) to Gibraltar and the Gulf of Tunis (M'Andrew and Deshayes), at depths varying from 8 to 35 fathoms.

Turton noticed that one of the valves is more convex than the other; the inequality is not great, but very perceptible. Independently of this character, and of its being infinitely more common, *T. crassa* differs from *T. balaustina* in being at least six times the size, having a more solid texture, and the ridges being stronger and more compact; the fry are oval instead of triangular. The one is the "porcelain of creation"; the other is common ware.

According to Brown, the present species is the type of Leach's genus *Arcopagia*, which Leach himself has since denominated *Cydippe*. It is the *Pectunculus depressior* of Da Costa, *T. rigida* of Pulteney, *T. subrotunda* of Deshayes, and *Cydippe Listeriana* of Leach; the young appears to be the *Arcopagia ovata* of Brown, and (in a "depauperated" and dirty state) is certainly the *T. maculata* of Turton. Adams's species of the last name is probably the *T. bimaculata* of Linné, a very common West-Indian shell.

B. Shell triangular, inequilateral, produced at the posterior end to an angular point, concentrically striated (one species having the right valve sculptured also by oblique longitudinal striæ); lateral teeth wanting or imperfectly developed.

3. T. BAL'THICA*, Linné.

T. balthica, Linn. Syst. Nat. p. 1120. *T. solidula*, F. & H. i. p. 304, pl. xx. f. 6.

BODY thick, pale yellowish, tinged with different shades of brown: *mantle* of a firm texture, fringed with fine, but short, white filaments: *tubes* nearly hyaline, varying considerably in length both collectively and individually; the excretal one is curved upwards, and usually longer than the other, being often exserted to almost twice the length of the shell, plain at its orifice; the alimentary tube has from four to six very minute dentations at its aperture: *gills* two only, one on each side, rather elongated: *palps* enormous, triangular, broad at their bases and pointed at their extremities, smooth without and distinctly striated within: *foot* white, very large, muscular, of moderate length, slightly bent.

SHELL more triangular than round, usually convex and sometimes almost globular, varying in thickness according to the nature of its habitation, opaque, glossy: *sculpture*, fine, minute, and close-set but irregular concentric striæ, diversified by occasional lines of growth: *colour*, of all hues and shades from milk-white or yellow to crimson, often relieved by narrow zones or concentric belts of a deeper tint, rarely pink in the earlier stages of growth and abruptly becoming white afterwards: *epidermis* minutely wrinkled, fibrous at the sides and edges of the shell, light brown, or occasionally greenish, mostly effaced in full-grown specimens: *margins* rounded in front and on the anterior side, somewhat produced on the posterior side and ending in an obtuse angle, with a greater or less degree of flexure, and frequently with an angular ridge running from the posterior end to the beaks; dorsal margin sloping with a slight curve: *beaks* small, inflected, nearly contiguous; umbones scarcely projecting: *lunule* lanceolate, not very distinct: *ligament* strong, prominent, dark horncolour, now and then extending between the beaks to the lunule: *hinge-line* curved: *hinge-plate*t hick and broad, occupying between a third and a fourth of the circumference: *teeth* fixed in a shallow cavity or depression in the middle of the hinge-plate, and set either across it or in opposite directions; they consist of two small symmetrical cardinals in each valve, the posterior in the right valve and anterior in the left being bifid or cloven lengthwise: *inside* glossy and nacreous, often partaking of the external colour, and microscopically wrinkled: *pallial scar* large, triangular, extending in a line parallel with the front margin: *muscular scars* deep and distinct. L. 0·7. B. 0·8.

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* Inhabiting the Baltic.

Var. 1. *attenuata*. Shell smaller, more compressed, and of a thinner consistency, often eroded; epidermis also thin, partially iridescent; teeth very slight; inside chalky-white.

Var. 2. *minor*. Shell smaller and more triangular. L. 0·5. B. 0·55.

Var. 3. *nivea*. Shell of the same size as the last variety, but more compressed, snow-white.

HABITAT: Sand, gravel, and mud between tide-marks on every shore. Var. 1. Southampton (J. G. J.); Orwell estuary (Dr. Clarke). This is the Baltic form. Var. 2. Bantry Bay (Humphreys and J. G. J.) Var. 3. Llanrhidian Marsh in the estuary of the Burry River, Glamorganshire (J. G. J.) Our usual form (which may be termed *solidula*) abounds in all the later tertiary deposits, including the boulder-clay or 'till' and the Mammalian Crag. It may therefore be regarded in the main as a northern species; but it is likewise common in many parts of the south of Europe, as will appear from the following epitome of its geographical distribution: Behring's Straits to Kamtschatka, White Sea, and Nova Zembla to the Black Sea (Middendorff); Finland (Nordenskiöld and Nylander) to Kiel Bay (Meyer and Möbius), at depths varying from zero to 60 fathoms; North of France (De Gerville and others) to the coast of Spain (Gay); Toulon (Gay) to Mogador (R. T. Lowe) and Sicily (Scacchi and others); Labrador (Brit. Mus.) to Massachusetts (Say) and north-west coast of America (P. Carpenter). It is also fossil in the Uddevalla and Sicilian pliocene strata.

This species, so familiar to modern geologists, and such an important test for the discrimination between older and newer or quaternary deposits, was well characterized and figured by Lister. His method of giving the dimensions of a bivalve shell is generally correct and that which is now recognized, viz. the length representing the line of growth in the direction of the beaks, and the breadth the extent from side to side. Chemnitz has given, in a vignette in the sixth volume of his 'Conchylien-Cabinet' (p. 76), a diagram illustrating this mode of admeasurement. The animal has been excellently described by Bouchard-Chantereaux, who says that sometimes the only tube exserted is the branchial one, which the animal stretches out five or six inches in length, with a diameter of only a line, absorbing with an astonishing rapidity any minute object within its reach. It is essentially a hardy mollusk, accommodating itself to all degrees of temperature, and to every kind of water from nearly fresh to the saltest. The typical or original form inhabits the brackish and land-locked Baltic Sea. Lovén was inclined to consider this a degenerate variety of the same species as the *T. solidula* of Pulteney, but for the pallial fold being less deep in the latter form: Searles Wood, however, shows, in his 'Crag Mollusca,' that the extent of this mark depends on the comparative tumidity of the shell in many species of *Tellina* and allied genera. The last-named author has properly adopted the specific name *balthica*. It was at one time said that all geographical or local names are objectionable; and entertaining this opinion I even went the length of substituting fresh names whenever they occurred in the List of British Pulmonobranchous Mollusca, published in the 'Transactions of the Linnean Society.' But that was more than thirty years ago; and I have since been convinced that the objection to *all* such names is not tenable. The Committee appointed by the British Association to consider the subject of Zoological nomenclature did not even recommend that they should be entirely discontinued in future. In the present instance the word *balthica* is not only correct, but commemorative of the original discovery and of the habitable conditions which belong to the species. Although it does not tell the *whole truth*, there is no falsehood involved in the use of it, nor can it mislead any one. The size of my largest specimens from open bays, where the sea-water has the usual degree of saltness, is an inch in length and one and a quarter in breadth. Clark expressed an opinion that the animal "differs greatly from the typical *Tellinæ* in the branchial plate and character of the palpi, and thick obtuse foot." Mörch has referred this species to the genus *Macoma* (according to Gray *Macroma*) of Leach.

Da Costa gave it the appropriate specific name of *rubra*; and besides being the *T. solidula* of Pulteney, it is the *T. carnaria* of Pennant (but not of Linné), *Psammobia fusca* of Say, and has four or five other less-known names.

4. T. TE'NUIS*, Da Costa.

T. tenuis, Da Costa, Brit. Conch. p. 210; F. & H. i. p. 300, pl. xix. f. 8, and (animal) pl. K. f. 3.

BODY very flat, yellowish-white: *mantle* finely fringed: *tubes* white, nearly equal in length and diameter, the upper one being usually curved upwards: *gills* two only, one on each side, very large and membranous, nearly triangular, most delicately pectinated, and pale brown: *palps* triangular, not very long or pointed, nor so disproportionately large as in the last species, pectinated more strongly inside than outside, of a sombre hue, marked with paler lines which give them a mottled appearance: *foot* large, broad, compressed, not very pointed, slightly bent.

SHELL triangularly oval, flattened, thin, semitransparent, remarkably glossy and polished; the right valve is a trifle larger than the left: *sculpture*, exceedingly slight and indistinct concentric striæ, with occasional deeper lines of growth; the surface is also marked with a few short and obscure longitudinal lines: *colour* white, yellow, flesh, orange, pink, or rose, of various shades, sometimes whitish with a large rosy mark on the umbonal area, or with two divergent streaks of yellow or pink, one on each side of the beaks, or pink with similar whitish rays, or else with transverse bands of a deeper hue: *epidermis* slight and brilliantly iridescent: *margins* generally not much curved in front, more so and often bluntly angular on the anterior side, somewhat flexuous on the posterior side and produced to a rather sharp point, from which a slight ridge runs to the beak in each valve, separating the posterior area; this margin is obliquely truncate; the dorsal or ligamental margin has a straight slope to the upper angle of the posterior side: *beaks* small, nearly straight, scarcely inflected, but turned towards the posterior side: *ligament* short, but large, very prominent, light horncolour: *hinge-line* obtusely angular: *hinge-plate* much broader on the posterior than on the other side, and abruptly truncate at the end of the ligament: *teeth*, cardinals as in the last species; sometimes the left valve has a posterior, or the right an anterior lateral: *inside* glossy, having the same coloured markings as the outside, microscopically wrinkled, and striated towards the margin: *pallial scar* as in the last species: *muscular scars* oblong, large and conspicuous. L. 0·65. B. 0·95.

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* Thin.

HABITAT: All sandy beaches, at the low-water mark of neap tides or at the depth of a few fathoms. Fossil in the Belfast deposit (Grainger), Scotch glacial beds (J. Smith and Crosskey), as well as (on the authority of Philippi) in the Neapolitan and Sicilian newer tertiary strata. Its northern range comprises Upper Norway, in 10–40 fathoms, (and possibly Finland,) Sweden, and Normandy; and southward it has been noted on the Lusitanian shores, in the Mediterranean from Spezzia, Corsica, and Mogador to Sicily, and also in the Black Sea.

Known to Lister, who figured it as English in the 'Historia Conchyliorum.' Being also a Swedish shell it could hardly have escaped the notice of Linné, and it probably was his *T. incarnata.* That species is described in the 'Fauna Suecica,' and the size given ("extimi pollicis") is the same as that of *T. bimaculata.* The identity of our shell with the first-mentioned Linnean species was suspected by Mr. W. Wood; but as another species has been called *incarnata,* and Da Costa's name *tenuis* is now universally adopted for the present species, it is better to retain the latter name. According to Philippi, Mediterranean examples are much smaller than those from the German Ocean. In a specimen from Tenby the lateral tooth in the right valve is extraordinarily developed. The present species differs from *T. balthica* in the shell being oval, flat, thin, and remarkably glossy, with a sharp angle at the posterior extremity. Mr. Clark suggested the removal of both species to another genus. Possibly the *Tellinula* of Chemnitz, or *Tellinides* of Lamarck, might receive these and other species comprised in the section now under consideration.

T. tenuis does not burrow deep in the sand; and the shells may often be seen lining the upper tide-mark in large bays, having been torn from their soft beds and cast up by the waves. Helplessly stranded, amid sea-weeds and foam, they lie in the rays of the setting sun, wet and glistening, ruby, gold, amber, and opal. These petty wrecks always accompany a storm; and afterwards the sea puts on a sorrowful face*, as if half conscious and repenting of the havoc he had lately made. Who has not enjoyed at such a time a ramble on the wide beach, perhaps not unobservant of the various débris with which it is now strewn, albeit in a pensive mood and

"Framing wild fancies to the ocean's swell"?

The Ettrick shepherd may have had in his eye a scene of this kind when he wrote,

"While fairy shells in myriads lying,
The smooth hard sand in lustre dyeing,
Encircle with a far-seen chain
Of glory the most glorious main."

The sea in a happier aspect, decorating with shells the tawny brow of his bride, the shore, has been portrayed by a more modern poet in some well-known lines; and the conchologist ought to be doubly gratified by his favourite theme being so immortalized by the northern muse.

The *T. tenuis* of Chemnitz is a different species. Our shell is his *T. incarnata*, and probably that of Risso; but the descriptions of the latter are so vague and insufficient, that it is almost a waste of labour to attempt any identification of his species. It is the *T. planata* of Pennant and *T. polita* of Pulteney (but not either of the species so named by Linné), and the *T. exigua* of Poli.

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* "Whispering how meek and gentle he *can* be."

5. T. FA'BULA *, Gronovius.

T. fabula, Gron. Zoophyl. iii. p. 268, t. 18. f. 9; F. & H. i. p. 302. pl. xix. f. 9.

BODY clear white: *tubes* apparently rather longer than in *T. tenuis*, which the animal closely resembles (Forbes and Hanley).

SHELL triangularly oval or inclining to oblong, flattened, thin, semitransparent, glossy, and having a resplendent and prismatic lustre: *sculpture*, extremely fine, numerous, and sharply incised concentric striæ, which in the right valve are at first regular and parallel, but afterwards become stronger, more remote, imbricated, and flexuous, and slant diagonally from the upper part of the anterior side towards the front and posterior margin; the surface is also covered with much more numerous and close-set microscopical transverse striæ, as well as with a few slight longitudinal lines, as in the last species: the posterior side (and occasionally the anterior side also) is not marked by the larger striæ; the lines of growth are well defined and sometimes form distinct zones: *colour* pearl-white with frequently a tinge of yellow or occasionally of light orange: *epidermis* very thin and brilliantly iridescent: *margins* not much curved in front, semioval on the anterior side, flexuous on the posterior side and elongated to a rather sharp point, from which an obscure ridge runs to the beaks as in *T. tenuis*; the posterior margin is short and obliquely truncate; the dorsal margin is more or less straight, and slopes to the upper angle of the posterior side: *beaks* small, scarcely inflected, contiguous, and turned a little towards the posterior side: *ligament* as in the last species: *hinge-line* and *hinge-plate* also similar: *teeth*, in the right valve two erect, small, deeply cloven cardinals; in the left valve a cardinal of the same kind just under the beak, and a much smaller and laminar cardinal on the posterior side, which diverges from the other at about a right angle; each valve has a short indistinct lateral on the anterior side: *inside* chalky-white, except the line of the pallial scar and the whole of the muscular scars, which are polished: *pallial scar* as in the last two species, but larger, with the upper angle extending much further towards the beak, and infringing on the posterior muscular impression: *muscular scars* irregular, but distinct and visible outside. L. 0·5. B. 0·85.

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* A small bean.

Var. *ovata.* Shell smaller, of a more oval form in consequence of the posterior side not being so much produced, the oblique striæ partially evanescent, and the epidermis of a greenish tint.

Habitat: Common in sandy bays and voes, from low-water mark to 15 fathoms, on all our coasts. The variety is from the Hebrides, Lerwick, and Deal Voe. This species is fossil in the Belfast deposit (Grainger), and Mammalian Crag (Searles Wood). Landt has recorded it from the Faroe Isles (as *T. fragilissima*); Lilljeborg, M'Andrew, and Malm have taken it in the Scandinavian seas, at from 3 to 17 fathoms; North of France (De Gerville and others); Carthagena, 7 fathoms (M'Andrew); Gulf of Lyons (Martin); Nice (Vérany); Corsica (Requien); Algeria (M'Andrew in 35 fathoms, and Weinkauff); and Sicily (Scacchi, Maravigna, and Philippi).

This differs from the last species (*T. tenuis*) in its smaller size, more oblong shape, and attenuated extremity, fragile texture, much finer sculpture, and especially in the oblique striation of the right valve. Malm found the present species in the stomachs of *Platessa vulgaris* and *Gadus æglefinus*. Gronovius says that the vernacular name of this shell is "Sny-Boontje." Few would have suspected that the Dutch, as a people, had been nearly a century back such discriminating conchologists.

It is the *Tellinula fragilissima* of Chemnitz, *T. vitrea* of Gmelin (from the last-named author, who *more suo* changed the original name without taking any notice of it), *T. semistriata* of Solander's MS. (according to Dillwyn), and *T. discors* of Pulteney.

6. T. squa′lida*, Pulteney.

T. squalida, Pult. in Hutch. Dors. p. 29. *T. incarnata*, F. & H. i. p. 298, pl. xx. f. 5.

Body whitish with a rosy or fleshcolour tint: *mantle* having its edges strongly fringed: *tubes* speckled; orifices plain: *foot* large.

Shell triangularly oval, somewhat inequivalve (the left valve being larger than the right), flattened, rather thin but almost opaque, of a satiny lustre: *sculpture*, numerous and fine concentric striæ, which are more close-set in the young and afterwards become slightly laminar and imbricated; the posterior side has none of these striæ, but is marked across with oblique, flexuous, and more compact striæ, giving that side a rough or scabrous appearance; the right valve is more striated than the left; the surface is also covered with the same parallel and microscopical striæ as are observable in the last species: *colour* pale orange or yellow, with often a reddish mark near the beaks and occasionally one or two faint longitudinal rays of a whitish hue on the posterior side, which extend from the beaks to the lower margins of the fold: *epidermis* fibrous and brown, usually rubbed off except at the edges: *margins* rounded in front, semioval on the anterior side, abruptly sloping upwards, and produced at the posterior end to a sharp point something like that of a ploughshare; the posterior side is decidedly flexuous, as well as obliquely truncate; the dorsal margin on the posterior side is straight, and that side is divided lengthwise by two more or less deep and distinct furrows, which run from the beak to the posterior angle: *beaks* projecting, small, pressed together and worn by the contact, turned towards the posterior side: *ligament* rather large, prominent, dark horncolour, separating the valves by a long lanceolate gap or depression: *hinge-line* obtusely angular: *hinge-plate* rather narrow: *teeth*, cardinals as in *T. fabula*; the right valve only has a lateral, placed on the anterior side near the beak and of an obtusely triangular shape: *inside* polished, longitudinally striated towards the margin, coloured more deeply than the outside: *pallial scar* large, of the same shape as in all the other species of this section: *muscular scars* similar to those of *T. fabula*. L. 1·1. B. 1·8.

Habitat: Not common, on sandy coasts of the south and west of England, Wales, Ireland, and west of Scotland, from 7 to 15 fathoms; Dunbar (Laskey). The last-mentioned locality has been designated the "hotbed" of our spurious Mollusca: it is notorious that much confusion originated in species having been formerly stated to be found there, which are now ascertained to belong only to tropical seas. Fossil in the Kyles of Bute (Crosskey); Sicily and Tarento (Philippi). It does not appear to have been found in the north of Europe; but its southern range is very extensive, from the north of France to the Ægean (where it is littoral), Madeira, the Canary Isles, and Azores, at various depths not exceeding 49 fathoms.

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* Rough.

I have stated in the particulars of *T. tenuis* my reasons for considering that species the *T. incarnata* of Linné. He described it as a Swedish shell, but erroneously referred to Lister's figure of *Psammobia Ferröensis*. The present shell is not known as Scandinavian, and is at least three times the size stated by Linné for his *T. incarnata*. I believe the species which I have last described is partly the *T. planata* of the 'Mus. Ulr. Reg.' and 'Syst. Nat.'; but as the latter name is now used for a larger, although similar, Mediterranean shell, it may prevent confusion by continuing the old name (*squalida*) proposed by Solander and adopted by Pulteney. It would require a vivid imagination to suppose that this can be the *T. depressa* of Gmelin, the meagre description of which was taken *verbatim* from Gualtieri. Our shell has certainly none of the colours there indicated, "nunc candida, nunc purpurascente, nunc subrosea." Gualtieri's wretched figures appear to represent two different species; and no habitat is given. Poli called the present species *T. incarnata*, and Donovan *T. depressa*.

C. Shell oblong, inequilateral, angulated, and slightly gaping at the posterior end, concentrically striated; lateral teeth more developed.

7. T. DONA'CINA *, Linné.

T. donacina, Linn. Syst. Nat. p. 1118; F. & H. i. p. 292, pl. xx. f. 3, 4, and (animal) pl. K. f. 4.

BODY oblong, compressed, white: *mantle* not fringed, but finely dentated (Clark) ("conspicuously fringed," Forbes and Hanley): *tubes* long and slender, with plain orifices, marked at their sides by whitish lines, which appear to represent rows of cilia: *gills* suboval, nearly of the same size, pale brown, smooth outside, and striated inside by about 30 delicate vessels of the branchial circulation: *palps* subtriangular, narrow, longitudinally furrowed, but otherwise smooth outside and pectinated within: *foot* pure white, flat, broad, long and pointed.

SHELL triangularly oblong, compressed, of a moderate thickness, opaque, more or less glossy: *sculpture*, numerous fine concentric and rib-like striæ, which are more close-set in the young, and consequently cover the umbonal area in the adult, besides intermediate and more delicate striæ, only observable by means of a high magnifier, and then chiefly in the interstices of the larger striæ: *colour* yellowish-white, rarely saffron, ornamented with bright pink longitudinal rays and a more conspicuous but shorter streak of a deep rosy or carnation hue just below the beak in each valve on the ligamental side; the rays are generally broken or interrupted, and frequently confluent, and they vary in number and arrangement, being often in pairs; in some specimens the ground-colour is rosy and the rays white: *epidermis* fibrous, light reddish-brown, seldom retained except in the young: *margins* rounded in front, with an oblique and somewhat flexuous curve to the posterior end, also rounded and wedge-shaped on the anterior side, truncate and flexuous on the posterior side, which ends in a blunt angle; dorsal margins on both sides straight, the anterior twice as long as the posterior, forming between them at the point of junction a well-defined obtuse angle; the posterior side slightly gapes, and has an obscure ridge in each valve, extending from the beak to the point of the lower angle: *beaks* small, sharp, and contiguous, turned towards the posterior side: *ligament* large, prominent, dark horncolour, separating the valves by a lanceolate gap or depression, which would be a lunule if the ligament were not interposed and were seated (as in the *Veneridæ*) on the other side of the beak: *corselet* long and rather deeply excavated; its colour, as well as that of the ligamental depression, is carnation: *hinge-line* obtusely angular: *hinge-plate* thick, twice as broad on the posterior as on the anterior side: *teeth*, in the right valve two small cardinals, that under the beak on the posterior side being the larger, triangular, and slightly cloven, besides a short but strong anterior lateral near the cardinal tooth on that side, and a remote and smaller lateral on the other side; the left valve has similar cardinals, reversed in position, but no lateral tooth: *inside* highly polished and glossy, longitudinally striated towards the front margins, which are thickened, of an orange tint, usually marked with the posterior ray, and sometimes with another ray or streak of the same colour on the anterior side: *pallial scar* having a triangular sinus, which is shaped like a foot and ankle (as it is also in all the species of the preceding section), very large, extending at the upper end for three-fourths of the distance from the front margins to the beaks, and at the sides to the edges of the *muscular scars*: these last are large and irregularly oval. L. 0·8. B. 1.

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* So named from its resemblance to a *Donax*.

Var. 1. *Lantivyi*. Shell of a thinner texture, whitish or faintly tinged with yellowish-pink, not rayed. *T. Lantivyi*, Payraudeau, Moll. Cors. p. 40, pl. i. f. 13–15.

Var. 2. *distorta*. Shell rather more compressed, and less inequilateral in consequence of the posterior side being more produced and not so truncate as in the typical form, with a sharper point at that end. *T. distorta*, Poli, Test. Sic. t. 15. f. 11.

HABITAT: Southern, western, and eastern coasts of England, North and South Wales, all Ireland, and west of Scotland, in shell-sand and among nullipores, in 4–25 fathoms. Scarborough (Bean); Northumberland and Durham, rare (Alder); Holy Island (Eyton). I am not certain of any more northern locality, at home or abroad. Var. 1. Ullapool (J. G. J.). Var. 2. Exmouth (Clark); Loch Carron (J. G. J.); Hebrides (Barlee). This species occurs in a fossil state at Banff (J. Smith); Coralline Crag (S. Wood); Subapennine tertiaries (Brocchi); Sicily (Philippi). Its southern limits comprise the North Atlantic from the Boulonnais to the Lusitanian coasts and Madeira, the Mediterranean, Black Sea (Krynicki), and Ægean, at depths between 7 and 50 fathoms; and the two varieties have a range of nearly equal extent.

This elegant little shell can scarcely be mistaken for any other of the Tellens above described. Specimens vary in having the striæ more or less compact; in the young these are laminar on the posterior side.

It is the *T. trifasciata* of Pennant (but not of Linné), *T. variegata* of Poli, and *T. subcarinata* of Brocchi. This and the following species have many characters in common with *Psammobia,* and appear to form a connecting link between the two genera.

8. T. PUSIL'LA *, Philippi.

T. pusilla, Phil. Moll. Sic. i. p. 29, t. iii. f. 9, *a*, *b*. *T. pygmæa*, F. & H. i. p. 295, pl. xix. f. 6, 7.

BODY shaped like that of *T. donacina*, whitish and transparent: *mantle* plain-edged and not fringed: *tubes* nearly contiguous, although separate; incurrent tube bag-shaped, extremely short: excurrent much longer, very broad and dilated at the base, and then becoming cylindrical, four or five times the length of the other tube; orifices of both plain: *foot* very large, serrated at the sides.

SHELL so closely resembling a dwarf or miniature form of the last species, that it is only necessary to point out the difference. This never attains one-fourth of the cubical contents of *T. donacina*: it is more convex in every part and proportionally more solid: the sculpture is much finer and more regular: the colouring is brighter and more varied, being rose, pink, flamecolour, orange, sulphur, lemon, or milk-white, frequently of a uniform hue, but more often diversified by rays as in the other species, besides having the longitudinal streak on each side of the beaks; specimens have occasionally transparent rays on a white ground: the posterior side is not flexuous, gaping, produced, or angular, but abruptly truncate and somewhat rounded: both of the lateral teeth in the right valve are near the beak, instead of the posterior lateral being placed at a distance from it, owing to the relative extent of that side in the two species. L. 0·2. B. 0·35.

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* Little.

Habitat: Sandy ground, at depths of from 3 to 85 fathoms, on most of our coasts. I will enumerate a few localities:—Balta Sound and the deep sea or "outer haf" in Shetland (J. G. J.); Orkneys and north of Scotland (M'Andrew); west of Scotland (Bedford and others); Cork (Humphreys); Galway (Barlee); Dublin Bay (Walpole and Kinaghan); Coquet and Berwick Bay (Mennell); Holy Island, Northumberland (Alder); Fowey (Barlee); Land's End (Hockin and Mus. Turton.); Plymouth, Exmouth, and Channel Isles (J. G. J.). It is not uncommon on the Scandinavian coasts, from West Finmark to Bohuslän, in 10–25 fathoms; but it does not appear to have been found or noticed south of Great Britain. Philippi first described it as a fossil of the Sicilian tertiaries, adding "in Germania, ad Casselam, Freden, &c."

The shell exhibits in every stage of growth the marks of difference above specified with regard to *T. donacina*; and I have never seen any intermediate specimens. Yet such may exist. It is somewhat suspicious that the present species is only found north, and the other south of Great Britain. Both conjointly seem to inhabit no other coasts but our own. Further investigations may clear up the point as to the specific value of *T. pusilla*.

Philippi must have inadvertently communicated to Lovén the MS. name of "*pygmæa*," this species having been published by the former in 1836 as "*pusilla*."

The *T. calcarea* of Chemnitz = *T. lata*, Gmelin = *T. sabulosa*, Spengler = *T. inconspicua*, Broderip and Sowerby

= *Macroma tenera,* Leach = *T. proxima,* Brown = *T. sordida,* Couthouy, may be classed with *Hypothyris psittacea, Pecten Islandicus, Astarte crebricostata,* and *A. borealis* as having long ago existed in that part of the Atlantic which then covered the greater part of the British Isles; but all of them are now extinct in our seas. I have dredged valves of *T. calcarea,* but always in a semifossilized state (although retaining part of the epidermis), among the Hebrides and Shetlands; M'Andrew has taken similar specimens in Loch Fyne; and Professor Macgillivray mentions that one was brought up by a fishing-line off Aberdeen. This species survives, however, on the Danish coasts of the Baltic, and northwards to Spitzbergen, as well as on the shores of Asia and America from Behring's Straits to Massachusetts. It is one of the shells most characteristic of "glacial" deposits, and occurs in every tertiary bed up to the Red Crag. Its name ought always to be associated with that of the veteran geologist James Smith of Jordan Hill, who was the first to detect the remains of an Arctic fauna in this country. This was a quarter of a century ago; and we can even now understand the delight with which the discovery was hailed by scientific men, including of course Edward Forbes, whose pithy saying on the occasion—"Conchology is ris'"—will not easily be forgotten.

T. remies of Linné (*T. fausta,* Pulteney), *T. reticulata* of Linné (*T. proficua,* Pulteney), *T. lineata* of Turton (*T. Braziliana,* Lamarck), *T. bimaculata* of Linné, and *T. similis* of J. Sowerby are tropical species, and have, from accidental mistakes as well as from ignorance of the laws which regulate the geographical distribution of the Mollusca, been considered indigenous to this country. There is a greater probability that the *T.*

punicea of Gmelin (*T. læta,* Pulteney, and *T. inæquistriata,* Donovan) may belong to the southern fauna of Great Britain, as it inhabits the Mediterranean; but I do not think it ought to be admitted without further evidence. Pulteney is believed to have found it on the coast of Dorsetshire; Brown is reported to have dredged a specimen off Holy Island, and gives "Leith shore" on the authority of Sir Patrick Walker; and Mr. Spencer brought me a couple of valves from Herm. *T. elliptica* and *T. pellucida* of Brown are irrecognizable; the former is possibly the young of *Tapes pullastra,* and the latter the fry of *Lucina borealis.*

Genus III. PSAMMO'BIA *, Lamarck. Pl. VII. f. 4.

Body oblong or elongated, compressed: *tubes* longitudinally lineated or marked with rows of cilia; orifice of each tube, or only of the incurrent or alimentary one, furnished with dentate points.

Shell oblong or elliptical, equivalve, nearly equilateral, compressed, striated concentrically as well as longitudinally; posterior side somewhat truncate and gaping: *teeth,* two cardinals in each valve, the posterior one in the left valve being disproportionately small and set obliquely, the others cloven; no laterals.

Tellina and this genus are near neighbours; but in *Psammobia* the tubes are furnished externally with longitudinal rows of cilia, the shell is more or less equal-sided and sculptured by longitudinal as well as concentric striæ, and the posterior extremity has a decided gape.

Two other generic names (*Lux,* Chemnitz, and *Gari,* Schumacher) have precedence of that given by Lamarck, but they are antiquated.

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* Living in sand.

1. Psammobia tellinel'la *, Lamarck.

P. tellinella, Lam. An. sans Vert. v. p. 515; F. & H. i. p. 277, pl. xix. f. 4, and (animal) pl. K. f. 1.

Body oblong, pure white: *mantle* dentated in front and fringed behind from the beaks to the *tubes*: the latter are moderately long, tapering, and divergent; the excurrent tube is the more slender, and curved upwards, marked lengthwise with eight fine lines of intense frosted white running from one end to the other, and having its orifice encircled with exceedingly minute and short white cirri: orifice of incurrent tube furnished with six similar cirri and intermediate shorter ones: *gills* suboval, pale brown, hanging obliquely, and coarsely striated on both sides; upper very small: *palps* rather long, subtriangular, pointed, pale brown, outwardly smooth, and inwardly coarsely pectinated transversely, not furrowed as in *Tellina donacina*: *foot* flat, sharp-edged, slightly bent, and lanceolate at the point.

Shell oblong, compressed, rather thin than solid, opaque, slightly glossy: *sculpture*, very delicate and close-set but somewhat irregular concentric striæ, with occasional and more strongly-marked lines of growth; the concentric or transverse striæ are crossed by others, which are longitudinal and equally fine, but sometimes become larger and almost rib-like on the posterior slope; in fresh specimens the surface is thus faintly decussated, but the longitudinal striæ always predominate: *colour* yellowish-white tinged with violet or flamecolour, variegated by rays of either of those hues, or of pink, and diversified by short longitudinal streaks or wavy and irregular lines of the same tint; usually on the anterior (and frequently also on the posterior) side of the beaks are short but broadish rosy streaks as in *Tellina donacina*; rarely the colour is uniform milk-white or purple: *epidermis* thin, pale yellowish-brown, generally obliterated: *margins* slightly and obtusely curved in front, more acutely so on the anterior side, and bluntly pointed at the posterior extremity, from which the margin in each valve slopes with different degrees of curvature to the beak, the deflection on each side of the umbo being nearly equal; the posterior side is somewhat angular, and both sides are wedge-like: *beaks* small, sharp, contiguous, turned towards the posterior side: *ligament* short, prominent, at first of a golden yellow, but afterwards horncolour, more or less annulated, separating the valves (as in *T. donacina*) by an elliptical gape: *corselet* short but deep: *hinge-line* almost straight or very little curved in the adult, obtusely angular in the young, occasionally stained inside with rose-colour: *hinge-plate* narrow and thick, abruptly truncate at the outer end of the ligament: *teeth*, in the right valve two small knob-like and diverging cardinals, the anterior being a trifle the larger; in the left valve a small erect cardinal in the centre of the hinge, seated in a cavity, besides another minute laminar one in a line with the beak and at a right angle to the edge of the hinge-plate; the three largest teeth are bifid: *inside* polished and very glossy, coloured and rayed like the outside, and sometimes having a short white longitudinal streak below the beak, microscopically fretted throughout, and indistinctly striated lengthwise towards the edge, which is thickened: *pallial scar* well defined; sinus oval, not very large or deep, extending from the posterior muscular scar about halfway across the interior, apparently double in consequence of a shifting or enlargement of the tubular base: *muscular scars* irregularly triangular, anterior the larger of the two. L. 0·6. B. 1·15.

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* Resembling a small kind of *Tellina*.

Var. *gracilis*. Shell broader in proportion to its length, flatter, and of a slighter consistency, somewhat gaping at both ends; a few of the concentric striæ assuming the form of irregular grooves or ridges; colouring more delicate, sometimes bright orange or marked with short purplish streaks, and not unfrequently milk-white with dusky or pure white streaks.

HABITAT: English, Welsh, Irish, and Scotch coasts, from one extremity to the other, in sand and among nullipores, at depths between 4 and 85 fathoms, but locally distributed. The variety is from deep water off Shetland, and resembles *Galeomma Turtoni* in shape. *P. tellinella* is a fossil of the Coralline Crag. It inhabits the upper and western coasts of Norway, in 3–40 fathoms; and M'Andrew has taken it on the Lusitanian coasts, in 15–30 fathoms.

It is an active little mollusk burrowing and swimming with rapidity, the latter operation being effected by a series of jerks. The tubes are capable of great extension; the larger or imbibing one is sometimes as long as the shell is broad, and thrust out in every direction as if in search of food.

Montagu considered it the young of *P. vespertina*, which is invariably a flatter and more oval shell. Payraudeau seems also to have mistaken the two; the present species is probably his *P. fragilis*. It is the *P. florida* of Turton, but not of Lamarck.

2. P. COSTULA'TA*, Turton.

P. costulata, Turt. Conch. Dith. p. 87, t. 6. f. 8; F. & H. i. p. 279, pl. xix. f. 5.

BODY milk-white, delicately suffused with pink: *mantle* having thickened edges, which project beyond the valves in front and at the sides, and are slightly cirrated, especially at the posterior end: *incurrent* (or lower) *tube* very long, cylindrical, and octangular; each angle is clothed with a row of minute cilia and terminates at the orifice in a tooth-like point: *excurrent* (or upper) *tube* conical, contracted at the orifice, which is plain and covered with eight longitudinal rows of cilia like those of a *Beroë*; both tubes diverge from each other at a right angle, the lower one being straight or but slightly bent, and the other (which is much the shorter of the two) turned upwards: *foot* flexible and pointed.

SHELL resembling that of *P. tellinella*, var. *gracilis*, in almost every respect but the peculiar sculpture of the posterior slope. Instead of this part being simply marked by minute or delicate longitudinal striæ, it has from twelve to twenty strong and sharp thread-like ribs, radiating from the beaks to the outer margin in each valve, which is consequently scalloped or notched; this ribbed area is distinctly defined, and separated from the comparatively smooth portion of the surface. The shell is also of a thinner texture; the colour of the rays is deeper and usually purple, but not so regular; the streak on the anterior side of the beak is broader and more like a patch; and the posterior side is rather broader and more truncate. L. 0·45. B. 0·75.

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* Slightly ribbed.

HABITAT: In fine sand, at from 15 to 85 fathoms, off Guernsey (Turton, Metcalfe, Hanley, and Barlee); Torbay (Turton); Exmouth (Clark); Goran and Port Curno Cove, Cornwall (Peach and Miss Lavars); Birterbuy Bay, co. Galway (Walpole); Cork (Humphreys); Belfast Bay (J. G. J.); Ayr (J. Smith); Skye (Barlee); Shetland (M'Andrew, Barlee, and J. G. J.). I observed a specimen in Mr. Searles Wood's collection in the British Museum mixed with *P. tellinella,* and marked "Coralline Crag"; Apulia (Philippi). Sars has recorded it from Christiansund, and Lilljeborg from another part of the Norwegian coast; M'Andrew has dredged it off Gibraltar, Madeira, the Canaries, Mogador, Gulf of Tunis, Algiers, Balearic Isles, and Pantellaria, at depths varying from 3 to 60 fathoms; Martin has taken it in the Gulf of Lyons; Requien has enumerated it as a Corsican shell; Philippi described it as Sicilian; "Coasts of Greece (Graves and Spratt)," according to Forbes and Hanley. The number and extent of the localities above mentioned on the authority of Mr. M'Andrew are proofs of the energy and scientific skill with which his dredging operations have been conducted throughout a great part of the European seas. His tabulated results have been of the greatest service to me in the preparation of this work.

The animal is not less agile than that of *P. tellinella,* occasionally leaping like *Donax vittatus* and repeating the action three or four times in succession. The shell does not appear to attain quite the same size as the other species; my largest specimen is only half an inch long and nine-tenths of an inch broad.

Philippi at first gave this species the name of *P. discors,* but afterwards substituted that which had been previously published by Turton.

3. P. Ferröensis [*], Chemnitz.

Tellina Ferroënsis, Chemn. Conch. Cab. vi. p. 99. t. 10. f. 91. *P. Ferroensis*, F. & H. i. p. 274, pl. xix. f. 3.

Body elongated, white or of the palest brown: *mantle* clothed with a short white fringe, or rather with fine dentations: *tubes* of nearly equal size and length; the branchial is somewhat the larger and longer, and when not fully extended it appears finely corrugated and marked with two longitudinal bars, and its orifice has six plain cirri; the excretal tube curves upwards, and its orifice has no cirri: *gills* and *palps* nearly as in *P. tellinella*: *foot* very large, flat, long, and bevelled to a sharp edge.

Shell oblong and somewhat rhomboidal, compressed, rather solid, opaque, more or less glossy when not covered by the epidermis; the right valve is usually larger than the other and slightly overlaps it: *sculpture*, numerous fine, but not raised, concentric ridges, which are sharper on the anterior side and often laminar or slightly imbricated on the posterior side, besides minute and close-set parallel striæ in the interstices of the ridges; the surface is also covered with slight and indistinct longitudinal or radiating lines, and the posterior slope or area is often more or less marked with half a dozen slight ribs, which radiate from the beaks and (especially in the young) produce a cancellated and prickly appearance by their intersecting the transverse ridges: *colour* beneath the epidermis pink of different shades, diversified by longitudinal rays of yellow or milk-white, some of which are broader than the rest and frequently confluent or broken; the surface also is often marbled with short white lines or streaks; now and then (but rarely) the colour is uniform purple: *epidermis* thick, fibrous, more persistent than in either of the preceding species, dusky in the adult and yellowish with a green tint in the half-grown and young: *margins* not much rounded in front, and occasionally almost straight, semioval, and wedge-like on the anterior side, abruptly and obliquely truncate on the posterior side, with an indentation or flexure on the ventral side of the posterior angle; a keel extends from the beak to this angle, and the area thus separated is flat or depressed, and sculptured by the radiating ribs above mentioned; the dorsal or ligamental margin is serrated in specimens strongly sculptured and forms the upper side of an obtuse angle: *beaks* small, pointed, somewhat calyciform, almost contiguous, slightly turned towards the posterior side: *ligament* rather short, prominent, keeping the valves asunder in that part: *hinge-line* obtusely angular: *hinge-plate* thick, broader on the posterior side, abruptly truncate at the outer end of the ligament: *teeth*, in the right valve two triangular, somewhat diverging, and nearly equal-sized cardinals; in the left valve a central cardinal of the same size and a minute laminar one set obliquely or at a right angle to the hinge-plate; the three largest teeth are bifid: *inside* thickened, highly polished, and partially iridescent, usually stained with purple or lilac: *pallial scar* distinctly marked, sinuated as in the two last species: *muscular scars* irregularly triangular. L. 1. B. 1·8.

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[*] Belonging to the Faroe Isles.

Var. *elongata*. Shell broader or more produced at each end.

HABITAT: Rather common on all the British coasts, in sandy and nullipore ground, at depths of from 4 to 90 fathoms. The variety is from Ullapool. Fossil at Preston (J. Smith); Belfast (Grainger); Coralline Crag (S. Wood). The exotic distribution of this species, both north and south, is extensive, and embraces Iceland (Leach), Faroe Isles (Chemnitz), Scandinavia (Lovén and others), north of France (De Gerville and Macé), coasts of Spain and Portugal and the Canaries (M'Andrew), both sides of the Mediterranean (Scacchi, Weinkauff, and others), and Ægean (Forbes), the range of depth being between 3 and 40 fathoms in the former case, and between 8 and 40 fathoms in the latter. Brocchi and Philippi have included it in their lists of tertiary shells from Italy.

Couch mentions having taken a specimen from the stomach of a Picked Dog-fish, one of a predaceous tribe that might have been supposed to disdain such "small deer." The shells are always to a certain extent twisted, and sometimes so much so as to be distorted. The fry are triangularly oval.

P. Ferröensis was probably the *Tellina trifasciata* of Linné, as Müller believed. According to Lovén it is the *T. incarnata* of the 'Fauna Suecica,' but not of the 'Systema Naturæ.' It is strange that Linné referred to the same figure in Lister's 'Historiæ animalium Angliæ tractatus" (App. t. 1. f. 8) both for *T. incarnata* and *T. trifasciata*. That figure undoubtedly represents the present species. It is the *T. angulata* of Born (but not of Linné), *T. incarnata* of Pennant, *T. radiata* of Da Costa (but not of Linné), *T. fervensis* and *T. Bornii* of Gmelin, *T. truncata* of Spengler (but not of Linné), and (in its immature state) the *T. muricata* of Renier; S. Wood has noticed four other names given by palæontologists.

4. P. VESPERTI′NA*, Chemnitz.

Lux vespertina, Chemn. Conch.-Cab. vi. p. 72, t. 7. f. 59, 60. *P. vespertina*, F. & H. i. p. 271, pl. xix. f. 1, 2.

BODY suboval, elongated, yellowish-white: *mantle* finely fringed: *tubes* long, and apparently rather wider than in *P. Ferroënsis*; the branchial has six points at its orifice; the other is curved, and its terminal margin is irregular: *gills* hanging obliquely from the dorsal range, of a brown colour, rather coarsely pectinated; the upper pair are shorter and smaller than the lower: *palps* triangular, elongated and pointed, of a lighter colour than the gills, smooth on their outer surfaces and distinctly pectinated within; they are of equal length, and each pair is connected with the other by a membrane surrounding the mouth: *foot* very large, broad, and rather thick.

SHELL of a form between oval and oblong, or partly rhomboidal owing to the angularity of the posterior side, compressed, rather solid, opaque, more or less glossy when not covered by the epidermis: *sculpture*, numerous irregular and usually obscure concentric ridges, which are more observable in large specimens near the margins; the parallel and occasional lines of growth are conspicuous; the whole surface is marked by slight and irregular longitudinal or radiating lines, as well as by close-set microscopical striæ in the same direction, but these striæ are generally effaced; in young shells the posterior slope is sculptured by radiating ribs as in *P. Ferröensis*, but much less distinctly: *colour* beneath the epidermis yellowish-white, variegated by bright rays of a purplish-brown or lilac of different widths; whether the rays are present or not, the shell is frequently marbled, speckled, or spotted with white, and lineated with short dusky streaks; now and then specimens are found having the umbones of a uniform purple hue: *epidermis* rather thick and persistent, light yellowish-brown in the young, and of a deeper or olive-brown in the adult: *margins* not much rounded in front, obliquely curved towards the anterior side, where they are semioval and wedge-shaped, slightly indented or flexuous on the ventral side of the lower or posterior angle, abruptly and somewhat obliquely truncate but not sharply angular on the last-mentioned side, which is indistinctly defined by an obscure ridge extending from the beak to the lower angle; dorsal margin nearly straight or but little inclined, and ending in an obtuse angle which forms the upper side of the posterior margin: *beaks* as in the last species: *ligament* short, extremely prominent, annular and of a closely fibrous texture, funnel-shaped, with the smaller end proceeding from between the beaks and widening outwards; the large end is closed and held down to the dorsal edge by a membranous extension, which in the young is of a yellowish colour, the body of the ligament being horncolour; the valves are separated in that part as in the other species: *hinge-line* obtusely angular or gently curved: *hinge-plate* rather thick, broader on the posterior side, abruptly truncate at the outer end of the ligament: *teeth* as in *P. Ferröensis*: *inside* thickened, porcellanous, highly polished and slightly iridescent, yellow or lemoncolour tinged with purple near the beak, sometimes of a uniform lilac, marked with faint longitudinal striæ towards the front margins, and microscopically wrinkled like shagreen: *pallial* and *muscular scars* as in the other species. L. 1·25. B. 2·25.

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* Name derived from the similarity of the coloured streaks on the shell to the rays of the setting sun.

Var. 1. *lactea*. Shell milk-white; all the teeth more erect and recurved, and the smallest in the left valve triangular and pointed instead of laminar or ridge-like.

Var. 2. *livida*. Shell more oval, or longer in proportion to its breadth, of a uniform fawncolour, but shaded, and marked with the usual short dusky streaks; posterior ridge more developed and conspicuous.

Habitat: Local, but generally diffused, from low-water mark at spring-tides to a few fathoms, in sand. I will mention a few of the localities: Cornwall, Devon, Dorset, Channel Isles, Scarborough, Northumberland and Durham, Pembrokeshire, Pwllheli (M'Andrew), south and west of Ireland, Stranraer in Wigtonshire (Bedford), west of Scotland, Firth of Forth (Laskey, Brown, and Collins), Moray Firth (Dawson). Var. 1. Exmouth (Clark); Kenmare River (J. G. J.). Var. 2. Bantry Bay (Humphreys). This species has been found in a fossil state at Belfast by Mr. Grainger, and in the Coralline Crag by Mr. Searles Wood. Abroad it inhabits the Scandinavian sea from Finmark to Bohuslän, and southwards the coast-line from the North of France to the Canaries, as well as the European and African shores of the Mediterranean as far as Sicily and the Ægean, at depths varying from 7 to 40 fathoms. Sicilian tertiaries (Philippi).

At Kenmare this kind is eaten, as well as *Venus verrucosa*; and heaps of their shells may be seen about the huts of the peasantry. Twisted distortions now and then occur. My largest specimen is one and a half inch long by two and a half inches broad; but some collected by Lilljeborg in Upper Norway are of still greater dimensions.

Müller apparently considered this the *Tellina radiata* of Linné; and the descriptions in the 'Fauna Suecica' and 'Systema Naturæ' are not unsuitable; but the more detailed particulars given in the 'Mus. Ulr. Reg.' mention a character which our shell does not possess, viz. lateral or marginal teeth. Possibly the angular points of the hinge-plate were meant. The words are, "Marginales utrinque solitarii, remoti a Cardinalibus, distincti fossula in ipso margine." It is the *T. variabilis* of Pulteney, *T. depressa* of Pennant, *Solen pictus* of Spengler, *T. gari* of Poli (but not of Linné), *Psammobia florida* of Lamarck, and *T. albida* of Dillwyn (but not of Linné). Leach proposed the generic name of *Gobræus* for the present species.

Sanguinolaria deflorata is a tropical shell, and was wrongly introduced into the British fauna.

Genus IV. DO'NAX*, Linné. Pl. VII. f. 5.

Body oblong, compressed, rather thick: *mantle* having a double margin, the outer one of which is clothed with three rows of fringe: *tubes* not so long as in the other genera, longitudinally lineated; orifices cirrous.

Shell wedge-shaped, equivalve, inequilateral, rather solid, mostly smooth and covered with a glossy epidermis, but sometimes and partially sculptured by longitudinal striæ, some of which are decussated by concentric striæ: posterior side obliquely truncate: *teeth* consisting of a double and central cardinal, with a slight diverging laminar one on either side in the right valve, and two diverging cardinals (representing a reversed V) with a minute tooth between them at their junction in the left valve, besides laterals on each side of both valves near the beaks: *inside* having the margin usually more or less notched or crenulated.

Systematists are not agreed as to whether this genus should constitute the type of a family apart from the *Tellinidæ*. It is by no means easy to say how many and what kind of characters are essential for the formation of such a group. The animal of *Donax* resembles that of *Psammobia*, especially in the ciliated lines of the tubes or siphons; but the mantle has an outer and inner margin, the former being ornamented with three rows of cirri: the shell is not unlike that of some species of *Tellina* (e. g. *T. donacina*) in its cuneiform shape; but the dentition is more complicated. The ligament is placed at the smaller end of the shell, as in all the other genera belonging to this family. Under the above circumstances I have thought it best to unite the *Donacidæ* with the *Tellinidæ*, considering also that we have only *Donax* to dispose of.

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* A kind of fish mentioned by Athenæus.

The habits of the present genus are gregarious, and usually littoral, although in suitable localities, where a bed of sand extends out to sea, the *Donaces* may be found at some depth. According to M. Pictet it did not make its appearance until the Tertiary epoch. Chemnitz called it *Serrula*, and Poli *Peronæa*. Lamarck's genus *Capsa* is described as having no lateral teeth, and only differing in that respect from *Donax*: the late G. B. Sowerby added another character, viz. a smooth inside margin, and instanced our *D. politus* as one of the *types*; but that species certainly has lateral or side teeth.

A. Inside margin strongly notched.

1. DONAX VITTA'TUS *, Da Costa.

Cuneus vittatus, Da Costa, Brit. Conch. p. 202, pl. xiv. f. 3. *D. anatinus*, F. & H. i. p. 332, pl. xxi. f. 4, 5, and (animal) pl. K. f. 7.

BODY elongated, purplish-red or yellow: *mantle* open for two-thirds of its extent, thickened at the edges and having a double margin; one margin is short, with sinuous or scalloped edges; the other and outer one is fringed with three rows of cirri, the inner two consisting of moniliform white beads of two sizes, and the outermost or third row having short, close-set, fine filaments of the same colour; the cirri become longer and stronger as they approach the posterior side: *tubes* transparent, of equal length, and when fully exserted not more than half an inch long; incurrent tube ornamented with eight longitudinal ciliated lines of an opaque-white colour, which give it an octagonal appearance; these lines terminate at the orifice in eight small fimbriated prongs, which fold over and enclose the tube whenever anything passes into it; the excurrent tube has only six of these lines and as many terminal prongs; when the tubes are withdrawn, they are protected by a small pouch formed out of the mantle; siphonal orifices and cirri of a very pale orange colour: *gills* large, suboval, light brown; upper pair much smaller and shorter than the lower: *palps* rather long, triangular, pale yellow, smooth externally and distinctly striated internally: *foot* very large, much compressed, bevelled to a sharp edge and lanceolate point when fully extended; but when at rest or half exserted, it is puckered and transversely ridged.

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* Banded.

SHELL triangularly oblong, not very inequilateral, somewhat compressed but more convex towards the beaks and sloping from that part to the margins, rather thick, opaque, glossy and polished: *sculpture,* numerous fine longitudinal striæ, which radiate from the beak but do not extend to the anterior or larger side, and only cover about two-thirds of the surface; they are more crowded on the posterior slope; the posterior side is also marked with a few concentric or transverse striæ, which are scratch-like and very irregularly disposed, never reaching to the ventral area; these last striæ are usually flexuous, and observable on one or more parts of the posterior area but never on all parts of it; they are not found in the earlier stages of growth, and occasionally (but rarely) they are altogether wanting; where the two sets of striæ intersect each other a partial decussation is of course the result: *colour* yellow, brown, or purple of different shades, often variegated (especially in the young and half-grown specimens) with three rays of white, one proceeding from the beak, another crossing the ventral range, and the third running along the posterior ridge; the lines of growth are generally marked by broad concentric bands of a deeper hue; sometimes the colour is uniform milk-white: *epidermis* thin and smooth, like varnish, delicately and microscopically striated in a transverse direction: *margins* gently curved in front, with a slight indentation or sinuosity near the posterior side, which is gibbous, strongly angulated, obliquely but not abruptly truncate, and ends in a blunt and somewhat rounded point; the ridge which encloses a great part of this side is prominent and extends from the beak in each valve, enclosing a kind of enormous lunule with projecting lips; anterior margin semioval and wedge-shaped;

dorsal margin on the anterior side long and sloping but not curved, that on the posterior side being much shorter, diverging from the other at considerably more than a right angle, and nearly straight: *beaks* small, pointed, incurved, and turned towards the posterior or ligamental side: *ligament* very short, partly prominent, the lower half being imbedded in the hinge-plate, horncolour: *corselet* long, rather deep, with thickened and projecting edges: *hinge-line* obtusely angular: *hinge-plate* thick, much longer but narrower on the anterior than on the posterior side, abruptly truncate at the end of the ligament: *teeth*, in the right valve a triangular and cloven cardinal immediately below the beak, flanked on each side by a longer and laminar cardinal, the anterior of which is set obliquely and the posterior or larger one in a line with the ligament; laterals in this valve two on each side, receiving between each pair the single lateral of the opposite valve; the left valve has two diverging cardinals and an intermediate minute tooth or denticle; the laterals (one on each side) in that valve are short and sometimes tubercular: *inside* highly polished and usually glossy, more or less stained with violet, especially on the posterior side; margin finely and regularly notched from the anterior end to the ligament; the posterior dorsal margin is more closely notched or crenulated, and the other dorsal margin is quite smooth: *pallial scar* slight, with an oval and rather small sinus: *muscular scars* strongly marked, of an irregular shape. L. 0·6. B. 1·1.

Var. 1. *turgida*. Shell larger, ventricose, longer in proportion to its breadth, and nearly lustreless except in the young. L. 1. B. 1·6.

Var. 2. *nitida*. Shell somewhat smaller than usual and more convex, broader in proportion to its length, of a brilliant lustre.

Habitat: Large sandy bays, from low-water mark to a few fathoms within the Laminarian zone. Var. 1. Stornoway in the outer Hebrides (Barlee). Var. 2. Dredged in 18 fathoms, ten miles off Shields (Damon); and on the Dogger bank in 12–15 fathoms, thirty miles from Scarborough (Leckenby). This species is fossil in the Belfast deposit (Millen); Wexford (James); Ayr (Smith); Moel Tryfaen, Carnarvonshire, at the height (accurately ascertained) of from 1330 to 1360 feet above the present level of the sea, together with about fifty other species of shells mostly of an arctic character! (Darbishire); Mammalian Crag, Bramerton (S. Wood); Sicilian tertiaries (Philippi). M'Andrew has taken it on the coasts of Upper Norway in 3–25 fathoms; I noticed specimens from Jutland in the Royal Museum at Copenhagen; and southwards it occurs from Schelling on the Dutch coast to Vigo, as well as in the Mediterranean, Ægean, and Black Sea.

Marvellous accounts have been given of the agility of this little shell-fish, one of them being that when it is taken out of the sand it will endeavour to regain the sea by a succession of well-directed leaps. It certainly can twist itself about almost as actively as *Nassa neritea* does in the lagunes of Venice; and that is saying a good deal for it. The fry have triangular shells, with the posterior end more rounded and the beaks prominent; in this stage of growth it is the *D. rubra* of Turton. A specimen in my cabinet is inequivalve, the left valve overlapping and partly enveloping the other, as in *Corbula*. The colours of this shell do not soon fade; they are, as Tennyson says, of the kind

> "That keep the wear and polish of the wave."

This is the *D. trunculus* of Linné, although his references to the works of Adanson, Buonanni, Klein, and Argenville belong to an allied species which now generally bears that name. His descriptions in the 'Fauna Suecica' as well as in the tenth and twelfth editions of the 'Systema Naturæ' exactly apply to the present species; and the first authority which he cites is Lister's 'Treatises on English Animals.' Da Costa finds fault with these inconsistent references; but he seems to have lost sight of the fact that Linné knew little more of exotic shells than he could glean from the meagre accounts and inartistic figures of the authors who had preceded him. It is also the *D. trunculus* of Müller's 'Zoologia Danica,' and of all British conchologists except Forbes and Hanley. But since the name *trunculus* has been appropriated by Continental writers for the Mediterranean species, I have followed Searles Wood in adopting that which was given by Da Costa to our shell. The latter is the *D. vittata* of Lamarck, but not his *D. anatinum*, which appears to be the same species as that which is now called *D. trunculus*. The principal difference between his diagnoses of the last two species is that the former is described as "oblonga," and doubtfully identified with *Tellina donacina* and with Gualtieri's figure of another species of *Tellina* which it is impossible to make out; while the latter is designated "elongata;" and Linné, Lister, Adanson, Knorr, and other heterogeneous authorities are cited. M. D'Orbigny (père) gave me in 1830 a specimen of the Mediterranean shell, named "*Donax anatina*" on the authority of Lamarck, with whom he had been in frequent communication. Lamarck described his *D. vittata* from British specimens which he had received from Dr. Leach. Our shell is also the *D. semistriata* of Poli, and probably the *D. fabagella* of Lamarck. The merits of the last-named author as a natural philosopher and the founder of the modern school of inquiry into the origin of species are unquestionably great; but his analytical powers were of an inferior order. He evidently did not possess what Aristotle considered the highest excellence of human wisdom—the faculty of discriminating things very much alike.

2. D. TRUN'CULUS *, Linné.

D. trunculus, Linn. Syst. Nat. p. 1127 (partly); F. & H. i. p. 338.

Body pale yellowish-white: *tubes* rather long, cylindrical, thick, and smooth but lineated; cirri of the alimentary tube branched: *foot* compressed, lanceolate, sinuous. (Poli.)

Shell distinguishable from that of *D. vittatus* by the following characters:—it is acutely rather than obtusely triangular, more inequilateral and bright-looking: the longitudinal striæ are finer and less impressed, and there are no transverse or concentric striæ: the colour is usually olive, blended with chestnut and variegated by numerous white rays, or yellow with chestnut rays, sometimes orange outside and flamecolour within, or milk-white: the posterior margin is more or less abruptly truncate, and not sloping gradually to a blunt point: the umbones are more prominent: the lateral teeth are much less developed, and often rudimentary or indistinct: and the inner margin is quite smooth below the ligament, instead of being notched or crenulated as in *D. vittatus*. It attains a larger size than that species, although my British specimen is only $\frac{7}{10}$ths of an inch long and $1\frac{1}{10}$ inch broad.

Habitat: Exmouth (Clark); Torbay (Battersby). Only one specimen was obtained in each of these localities, mixed with the other species. It occurs in the Red Crag (S. Wood), and also in the Italian tertiaries (Brocchi and Philippi). South of Great Britain it is universally diffused, from the coasts of Brittany (De Gerville and Collard des Cherres) to Gibraltar (M'Andrew) and throughout the Mediterranean, Ægean (Forbes), and Red Sea (Von Hemprich and Ehrenberg), both littoral and at depths varying from 2 to 30 fathoms.

This may be the Senegal shell-fish named "Pamet" by Adanson, and which he says the negroes cook and eat, believing that it acts as a laxative. We are told by Poli that in his time there was no better kind of shellfish sold at Naples, either for making sauces or season-ing small rolls of bread; and he adds that it was collected by means of a rake and net called a "rullo." According to Philippi *D. trunculus* is still esteemed a delicacy in the south of Italy, and known in Sicily as "cozzola." M'Andrew says it is as common on the table as on the shore at Malaga, being procured by men wading with nets as in England for shrimps. It may also be seen with other "frutti del mare" in the fish-market at Genoa.

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* Having a small piece cut off.

The present species is the *Serrula lævigata* of Chemnitz (not his *Donax lævigata*) and *D. anatinum* of Lamarck; Risso contrived to make half a dozen species out of it.

B. Inside margin smooth, or minutely crenulated in the adult.

3. D. POLITUS *, Poli.

Tellina polita, Poli, Test. Sic. i. p. 44. t. xxi. f. 14. 15. *D. politus*, F. & H. i. p. 336, pl. xxi. f. 7.

BODY yellowish-white: *tubes* cylindrical, short, thick, smooth but lineated, crowned with plain cirri: *foot* lanceolate, white. (Poli.)

SHELL triangularly oblong, not very inequilateral, much compressed, with a greater convexity in the umbonal part, rather thick, opaque, lustrous: *sculpture*, scarcely any other than a few slight and indistinct concentric lines, and occasional marks of growth which alone are perceptible by the naked eye: *colour* chestnut blended with olive, beautifully marbled or flecked with creamcolour and marked with a conspicuous longitudinal ray of the same tint, which proceeds from the beak and is obliquely curved towards the ventral margin on the anterior side; this ray becomes broader as it approaches the margin, being there of a considerable width in full-grown specimens; the beaks are usually violet or flamecolour, and variegated by a blotch of dusky purple under the ligament, and sometimes by a similar but fainter stain on the other side of the beak; the lines of growth are also distinguished by narrow bands of violet when that hue appears: *epidermis* thin and smooth, olivaceous: *margins* gently curved in front, without any indentation or sinuosity, obliquely and gradually truncate on the posterior side, which ends in a blunt and rounded point and has a slightly angular slope; anterior margin semi-oval and wedge-shaped; dorsal margin on that side long and nearly straight, and on the posterior side about two-thirds as long and equally straight, the point of their divergence representing an angle of about 70 degrees: *beaks* small, pointed, incurved, and turned towards the posterior side: *ligament* very short, partly prominent, the lower half being imbedded in the hinge-plate, horncolour: *corselet* long, rather deep, with thickened and somewhat projecting edges: *hinge-line* set at a very obtuse angle: *hinge-plate* thick, much longer but narrower on the anterior than on the posterior side, abruptly truncate at the end of the ligament, in consequence of the latter being partly imbedded in it: *teeth*, cardinals as in *D. vittatus*, but much slighter and ordinarily not so distinctly cloven; laterals as in that species, developed in the young but nearly obliterated in aged individuals: *inside* highly polished and glossy, tinged with violet, or else milk-white with a flamecolour stain on the anterior dorsal side, besides a dusky-purple streak near the beak on that side and two others of the same hue on the posterior side; margin closely and minutely crenulated in every part except the hinge-line: *pallial scar* slight, with a tongue-shaped sinus extending from the posterior side about halfway across the interior of the shell: *muscular scars* distinct, anterior triangularly oblong and irregular, posterior smaller and nearly circular. L. 0·7. B. 1·35.

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* Polished.

HABITAT: In sand, at the low-water mark of spring-tides, and at the depth of a few fathoms, in the Channel Isles and on some parts of the Devonian and Cornish coasts; frequently in Bantry Bay among the "Coral-sand" procured for manure, and which is so productive of good shells. Leach states that it is common on most of our shores, and specifies South Wales as one of the localities; but, although that was for the greater part of my life my home and chief "hunting-ground," I never found this species in the Principality nor learnt from any of my correspondents that it had been discovered there: *D. vittatus* must have been mistaken for it. The present species occurs in the Coralline Crag. It does not appear now to inhabit any part of the European sea so far north as the Suffolk coast, its recent distribution being entirely southern. De Gerville has recorded it from the north of France, Cailliaud from the Département of Loire Inférieure, M'Andrew from the coasts of Portugal and Gibraltar in 8–30 fathoms, Payraudeau and Requien from Corsica, M'Andrew and Weinkauff from Algiers, Scacchi and others from Sicily, and Forbes from the Ægean. According to Philippi it is a fossil of the South-Italian newer tertiaries.

Linné did not notice this elegant shell, although he might have seen a good representation of it in Lister's 'Historia Conchyliorum' (A. pl. 385. f. 232, "I. Garnsey"). Besides being local, and therefore comparatively scarce, it may be readily known from either of the two foregoing species by being flatter, more oblong, and not so inequilateral, and by the surface being more polished and lustrous, and never striated; the single white ray is also a peculiar feature; the inside margin appears smooth, and the crenulations are only to be seen under a tolerably strong magnifier; and the lateral teeth are much less distinct.

It is the *Tellina variegata β* of Gmelin, and probably his *T. vinacea* from Buonanni ("Habitat in mari britannico et balthico"!), *D. complanata* of Montagu, *D. longa* of Bronn, and *D. glabra* of Searles Wood.

D. Laskeyi (*Tellina Laskeyi*, Montagu) is not unlike the last species in shape, but is much smaller, the streaks on each side of the beak are more conspicuous, and the lateral teeth are more blunt and obscure. I have one of the original specimens (a single valve), owing to the kindness of my late friend Mr. Dillwyn, who received it from Colonel Montagu. It is supposed to be a West-Indian shell; and there is no satisfactory evidence that it has ever been found in the British seas, much less in the Firth of Forth.

D. denticulatus (Linné) is West Indian, and likewise "spurious." Chemnitz called it *D. punctata,* Da Costa *Cuneus truncatus,* and Donovan *D. crenulata,* the last alleging that it was "very common on the western coasts of England and also on those of Ireland and Scotland." Linné assigned to this species the Mediterranean as a habitat, on the authority of F. Logie, one of his pupils; Payraudeau and others afterwards recorded it from the same locality; and the Rev. R. T. Lowe lately observed specimens at Mogador. It is the "Nusar" of Adanson.

Family XV. MACTRIDÆ, (Mactradæ) Fleming.

Body oval or oblong: *mantle* closed to some extent, fringed at its edges: *tubes* more or less elongated, in some genera united and in others separate: *gills* consisting of an unequal pair on each side: *foot* tongue-shaped and flexible.

Shell equivalve, triangularly oval or oblong, sometimes gaping at the posterior end or at both ends, usually sculptured by fine concentric striæ: *epidermis* fibrous: *ligament* double, the external one slight and placed on the larger side of the shell, and the internal one (or *cartilage*) solid, placed on the same side, and occupying a large pit or cavity in the hinge: *teeth,* two cardinals in each valve (except in *Scrobicularia,* which has only one in the left valve), besides more or less distinct laterals: *pallial scar* sinuated: *muscular scars* deep or distinct.

The present volume will conclude with this family, being the last of those which have the mantle open. It is remarkable for possessing a double ligament, one external and the other internal; but otherwise it is not of much repute, whether we look to the shape or to the colour of the shell. Usually the former is short or stumpy, and the latter pale and unattractive. It is, however, a numerous and widely spread group: its favourite habitat is sand or mud. Dr. Carpenter has ascertained that the texture of the shells presents the same general characters as in the *Tellinidæ,* but that the indications of organic structure are more distinct. In those of *Mactra* and *Lutraria* the cells are especially observable, although irregular in the one and elongated in the other.

Genus I. AMPHIDES'MA*, Lamarck. Pl. VIII. f. 1.

Body oval, compressed: *mantle* thick, united for two-thirds of its length: *tubes* separate and unequal, not very long, and having their orifices fringed with cirri.

Shell oval, only slightly inequilateral, wedge-shaped, closed at both ends, longitudinally as well as concentrically striated in some species: *beaks* turned towards the posterior side: *teeth,* two cardinals, of unequal size, in each valve; laterals more or less distinct.

Although, as Lamarck observed, the *Amphidesmata* in the aggregate appear to form an artificial group—and, as originally constituted, they were truly a heterogeneous assemblage of species—the characters of this genus in a restricted sense are peculiar, and it serves to connect the present with the immediately preceding family. In the outward form of the shell (as well as in the siphonal tubes) it resembles *Donax,* and in the structure of its hinge *Mactra.* Whether the genus *Mesodesma* of Deshayes is different may be an open question; but there is much less cause to separate Turton's genus *Ervilia,* which not only was very inadequately and inaccurately defined, but did not even include the only British species lately assigned to it by Forbes and Hanley, and which will be now described.

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* Having a double ligament.

AMPHIDESMA CASTA′NEUM *, Montagu.

Donax castanea, Mont. Test. Brit. App. p. 573, t. 17. f. 2. *Ervilia castanea*, F. & H. i. p. 341, pl. xxxi. f. 5, 6.

SHELL obliquely and triangularly oval, or inclining to oblong, convex, thick, opaque in the adult and semitransparent in the young, glossy: *sculpture*, slight and irregular concentric striæ, which now and then become laminar on the anterior side; and in fresh specimens may also be observed numerous and minute longitudinal striæ, especially on the posterior side, which radiate from the beaks and extend to the margins: *colour* reddish-chestnut, of a deeper tint on the posterior side, with a short chocolate streak or ray in each valve, curving from the front or ventral margin to about two-thirds of the distance from the beak; this streak is narrow at the top and rapidly enlarges to its base as in *Donax politus*; occasionally the colour is milk-white: *epidermis* slight, yellowish: *margins* nearly straight or but little curved in front, rounded and semioval at each end, sloping behind from the beaks at an obtuse angle, where the dorsal margins are straight, and half as long again on the posterior as on the other side: *beaks* very small, blunt and calyciform, incurved, turning a little towards the posterior side; umbones rather tumid but not projecting: *ligament* extremely small and caducous: *cartilage* thick, contained in a triangular pit which shelves inwards and is enclosed by strong walls or sides: *hinge-line* gently curved: *hinge-plate* very strong, solid, and broad: *teeth*, in the right valve a large erect, triangular and oblique cardinal on the anterior side, and a smaller diverging one on the other side of the cartilage-pit, besides a long but indistinct laminar lateral on each side; in the left valve are similar cardinals but of more equal size, and the laterals are usually obliterated or obscure: *inside* polished and glossy; margin minutely and closely crenulated: *pallial scar* well defined, with a rather short oval sinus which does not reach half way across: *muscular scars* oval, the anterior being the deeper and more conspicuous. L. 0·3. B. 0·5.

HABITAT: Coasts of Cornwall and Scilly Isles, in 20–54 fathoms, but more frequently thrown up on sandy beaches; Herm (Macculloch); Cork (Humphreys and J. G. J.); dredged off Arran Isles, co. Galway, in 10–12 fathoms (Barlee). In the latter case only were the specimens perfect, although young, and without the animal. Laskey gives "Dunbar," which (to say the least) is a questionable locality. The notices of its extra-British occurrence are as follows: Cherbourg (Récluz); coasts of Spain and Portugal, Madeira and the Canaries, at depths varying from 12 to 30 fathoms (M'Andrew); St. Michael, Azores (H. Drouet); Red Sea (Forbes and Hanley).

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* Chestnut-colour.

The animal is unknown. M'Andrew seems to be the only one who has taken this curious species in a living state, and he probably had no opportunity of examining it.

The *A. nitens* of Montagu is West Indian and not British.

A. corneum (*Mactra cornea,* Poli, but not *A. cornea* of Lamarck), being the *Donax plebeia* of Pulteney, *A. donacilla* of Lamarck, and *Donacilla Lamarckii* of Philippi, is a common Mediterranean shell, but has never been dredged or taken on our coasts under circumstances that would preclude its being considered exotic.

A. deauratum (Turton), or *Mesodesma Jauresii* of De Joannis, which according to Turton was dredged off Exmouth, is a Newfoundland species. I was informed that the original specimen came from Lieutenant Griffiths, who had made more than one voyage to North America, and whose mother's collection of shells was much enriched by his endeavours to please her. Mrs. Griffiths was an old correspondent of Dr. Turton, as is evident from the frequent mention of her name in his 'Dithyra.'

Genus II. MAC′TRA*, Linné. Pl. VIII. f. 2.

Body oval, tumid: *mantle* thick, open in front: *tubes* united, enclosed in a sheath, of equal length, and extensile; orifices ciliated.

Shell triangularly oval, ventricose, nearly equilateral, slightly gaping at the posterior end, concentrically striated, and occasionally (but slightly) marked with longitudinal lines: *beaks* turned towards the anterior side, separate: *teeth*, two thin, erect, and diverging cardinals in each valve; those in the right valve are of unequal size; and those in the left valve equal-sized, united at their bases, and apparently forming a single forked or chevron-shaped tooth; laterals large and laminar, two on each side in the right valve, and one on each side in the left valve: *pallial scar* having a short sinus.

The shells comprised in this ancient genus are always recognizable by their triangular shape and strong hinge-process. Searles Wood says that, in a fossil state, they have been obtained in the Lias and Greensand formations. The genus is largely represented in the newer Tertiaries, and continues in a flourishing condition at the present day. They seem to prefer sand to mud as a dwelling-place.

A. Shell of a plain or uniform hue; lateral teeth and sockets perpendicularly striated.—*Spisula*, Gray.

1. Mactra so′lida †, Linné.

M. solida, Linn. Syst. Nat. p. 1126; F. & H. i. p. 351, pl. xxii. f. 1, 5, and (siphons) pl. L. f. 2.

Body more compressed than in most of its congeners, milk-white, yellow, or light orange, occasionally tinted with brown: *mantle* less fringed on the posterior side than in other parts; edges thickened: *tubes* short, but often extended three quarters of an inch in specimens considerably under the average size; the orifice of each is furnished with 12–20 short pale-yellow, brown, or reddish cirri, which spring from bulbs:

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* A kneading-trough.

† Solid.

below them a bright orange line often encircles the siphonal sheath; a conical valve is now and then seen to protrude from the opening of the excretal tube: *gills* varying in colour from light orange to reddish-brown; upper pair larger than the other, obliquely and very finely pectinated: *palps* long, narrow, pointed, brown of different shades, more distinctly striated than the gills, particularly on the inner surfaces: *foot* large, fleshy, and white.

Shell representing in form an isosceles triangle, convex, usually solid and thick, opaque, somewhat but not very glossy, owing to the continual abrasion of the surface by the sand in which it is buried: *sculpture*, numerous slight and irregular concentric striæ, which often become laminar and almost rib-like in front and at the sides, and always at the dorsal margin; lines of growth strongly marked; on the anterior and ventral sides in some specimens may also be observed a few slight longitudinal raised lines which radiate from the beak: *colour* pale yellowish-white, sometimes stained with ochre from a sediment deposited in shallow or tidal waters: *epidermis* yellowish-brown, silky in the young and coarse in the adult, being in the latter state more persistent at the sides and towards the edges: *margins* curved in front, obtusely angular at each end, but more pointed at the posterior side, with a rounded slope from the beak to either extremity; the sides (especially the posterior) are more or less angulated: *beaks* very small and rather blunt, incurved, turning a little towards the anterior side; umbones more or less tumid and projecting: *ligament* short and slight, yellowish-brown: *cartilage* triangular, compact and strong, golden-yellow, placed obliquely in a direction opposite to that of the beaks and immediately under the ligament: *hinge-line* obtusely angular: *hinge-plate* extremely broad, thick, and flexuous, the cartilage-pit projecting in the middle: *teeth*, in the right valve a short laminar and erect cardinal on the anterior side, nearly parallel with the hinge-line, and a much slighter and scarcely raised cardinal forming one of the sides of the cartilage-pit; laterals in this valve two on each side, the inner surfaces of which are strongly pectinated or grooved in a perpendicular direction; the left valve has two short cardinals, also on the anterior side of the cartilage-pit, united at the base or point of the fork, and of equal height and length; laterals in that valve one on each side, deeply grooved like the laterals in the right valve, but on both sides and not merely on their inner surfaces: *inside* more or less glossy, microscopically freckled, often iridescent, and slightly streaked lengthwise towards the front margin: *pallial scar* distinct, with a short and tongue-shaped sinus: *muscular scars* irregularly triangular, deep, and of equal size. L. 1·4. B. 1·6.

Var. 1. *truncata*. Shell longer in proportion to its breadth, gibbous, and of a thicker texture; sides more compressed or truncate; umbones prominent; hinge and teeth stronger. *M. truncata*, Montagu, Test. Brit. Suppl. p. 34; F. & H. i. p. 354, pl. xxiii. f. 1.

Var. 2. *conjunctiva*. Shell much smaller, having the same proportions as the variety *truncata*, and also rather ventricose, but thin; umbones not more prominent than usual. L. 0·6. B. 0·85.

Var. 3. *elliptica*. Shell invariably smaller than the typical form, broader in proportion to its length in consequence of the sides being more produced, and of a thinner texture; umbones not prominent. L. 0·75. B. 1·25. *M. elliptica*, Brown, Ill. Conch. G. B. & I. p. 108, pl. xli. f. 6; F. & H. i. p. 356, pl. xxii. f. 3, and (animal) pl. L. f. 1.

HABITAT: In gravelly sand, at low tides and at the depth usually of only a few fathoms, on every coast. Var. 1. South of Devon and Cornwall, Tenby, Irish coasts, Firth of Forth, Clyde district, Orkneys, and Lerwick. Var. 2. Shetland (J. G. J.). Var. 3. Sandy bays, at depths of from 10 to 100 fathoms: the dorsal area is sometimes ribbed in the variety *elliptica*, as well as in the typical form. This exceedingly variable species occurs in all our newer tertiaries, from the last raised beach to the Coralline Crag. The ordinary kind and the variety *truncata* have been chiefly noticed as littoral and in southern latitudes, their furthest limit being Sicily, where the former is also fossil; the only northern locality that appears to be recorded is the Scandinavian coast, on the authority of O. F. Müller. The variety *elliptica* has essentially a northern range, from Iceland (Steenstrup) to Kullen in the south of Sweden (Lovén), at depths of from 7 to 150 fathoms.

M. solida was formerly, and perhaps is still, eaten in Devon and Cornwall. In Leigh's 'History of Lancashire' it bears the singular and certainly not plebeian name of "a pectunculus with azurine circular lines interpolated." The animal is not in the least timid; and soon after being caught and put into a vessel of sea-water, it displays its agility by leaping about with its tubes extended. In some specimens of the variety *elliptica* the lateral teeth in the left valve are only striated on the outside. The authors of the 'British Mollusca' owned, in the Supplement to that excellent work, their suspicions that the *M. truncata* of Montagu ought to be united with the present species. I must take another step in the same direction, and reduce the *M. elliptica* of Brown to the rank of a variety. I may be wrong, and am open to conviction; but I confess that I cannot draw a line which will separate one more than the other of these so-called species from the typical form. I expect that some of my scientific readers will lay down the book and say to themselves, "Well! I wonder where all this radical innovation will end! Who can possibly doubt *M. elliptica* being a good species? Why, it is much smaller, of an oblong shape, thin, and glossy; while *M. solida* is triangular, thick, and dull. Even the young of each species exhibits its peculiar characteristics." In reply I would ask the annotators to recollect the much greater difference that exists between shells of *Buccinum undatum* taken at low water and at a depth of from 70 to 80 fathoms, as well as with respect to *Venus gallina* and other bivalves subject to similar bathymetrical and climatal changes. I regard *M. truncata* as the littoral or shallow-water and southern variety, and *M. elliptica* as the deep-water and northern variety of one and the same species. Clark says that *M. elliptica* appears distinct, because of its delicacy and elegance; but he adds that *M. solida* is at Exmouth strictly a littoral species, and that the other is never taken except by the dredge in the coralline zone, six miles from the shore. Every conceivable gradation of shape and solidity may be seen in a recent state; and the union of *M. solida* and *M. elliptica* is cemented by palæontological researches—showing the advantage (if not the necessity) of such investigations in the study of the Mollusca. As Searles Wood has remarked, specimens of *M. ovalis* from the Red Crag may belong to either species. I may also observe that when *M. solida* gradually finds its way into deeper water than it had been accustomed to—for instance, in descending from the Dogger bank down its slopes to the Silver-pits on the Yorkshire coast—the shell becomes more slender and glossy, although of nearly the usual size. It has then all the appearance of a large *M. elliptica.*

The typical form is the *Trigonella gallina* of Da Costa, *M. vulgaris* of Chemnitz, and probably *M. castanea* of Lamarck; and the variety *truncata* is the *Trigonella zonaria* of Da Costa, *M. subtruncata* of Donovan (but not of Da Costa), *M. crassatella* of Lamarck, and *M. crassa* of Turton. The latter variety was figured by Lister as "Concha crassa."

2. M. SUBTRUNCA'TA *, Da Costa.

Trigonella subtruncata, Da Costa, Brit. Conch. p. 198. *M. subtruncata.* F. & H. i. p. 358, pl. xxi. f. 8, xxii. f. 2, and (siphons) pl. L. f. 3.

BODY convex, milk-white with sometimes a faint tinge of yellow: *mantle* having its edges crenated or serrated rather than fringed: *tubes* clothed with an evanescent epidermis, varying in colour from white to yellowish or reddish; their sides are scabrous at intervals, and the excretal tube is rough with a serrated keel, as well as furnished with the usual retractile valve; orifices fringed with a double row of white, yellow, or pale-red cirri: *gills* and *palps* light brown: *foot* narrow and tapering, yellowish-white.

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* Somewhat truncated or lopped.

SHELL so closely allied to *M. solida*, and particularly to its variety *elliptica*, that I will content myself with pointing out the leading characteristics in which it differs from that species. This is much smaller than the typical form of *M. solida*, more convex, distinctly and strongly angulated on both sides, in consequence of which a large lunule-shaped depression is formed in front of the beaks, and another at their back; it is deeply and regularly striated or grooved in those parts, as well as frequently on other portions of the surface; the umbones also project considerably more than in either the above form or variety, owing to the contraction and angularity of the sides. L. 0·8. B. 1·1.

Var. 1. *striata*. Shell larger and thicker, its margins representing almost an equilateral triangle, extremely gibbous, more deeply and thoroughly striated. *M. striata*, Brown, Ill. Conch. G. B. & I. p. 108, pl. xli. f. 10.

Var. 2. *inæqualis*. Shell resembling the last in every respect but the proportional length of the sides, the posterior being obliquely produced to a wedge-like point.

Var. 3. *tenuis*. Shell more ventricose, but expanded, of a much thinner texture, longer in proportion to its breadth, smooth or but very slightly and irregularly striated in front, although having the usual grooves or ridges on the dorsal part of each side.

HABITAT: With the last species and equally diffused, from low-water mark to 27 fathoms. Var. 1. Exmouth, Irish coasts, west of Scotland, and Lerwick. Var. 2. Lough Strangford (Adair). Var. 3. A single valve only, dredged in 78 fathoms, 40–50 miles south-east of the Whalsey Skerries in Shetland. This remarkable variety is not unlike *M. stultorum* in shape and consistency; but it has the peculiar dorsal grooves and striated lateral teeth of the present species; it is analogous to the variety *elliptica* of *M. solida*. Mr. Alder also mentions, in his 'Catalogue of the Mollusca of Northumberland and Durham,' "a thinner variety from deep water." *M. subtruncata* is not uncommon in our newer tertiaries as far back as the Red Crag. It ranges from East Finmark (Danielssen), throughout the North Atlantic, to Gibraltar (M'Andrew), both sides of the Mediterranean to Sicily (Scacchi and others), and to the Black Sea (Middendorff), at depths varying in each of these tracts from the shore-line to 40 fathoms. Brocchi has recorded it among his Subapennine fossils, and Philippi from the Sicilian tertiaries; and I found it in the Uddevalla beds, and at Biot near Antibes in upper miocene strata.

A small variety is gathered alive at low water in Lamlash Bay to feed pigs. (Alder.) According to Mr. Hyndman this species is called the "Lady-cockle" at Belfast. Mr. Norman says that it goes by the name of "Aikens" in the Clyde district, where it is frequently used as bait, and for that purpose either raked up from the sands at low tides or gathered by the hand when thrown up on the beach by storms. In Dr. Landsborough's agreeably written 'Excursions to Arran' it is stated that the last-mentioned name is "confined to the Lowlands; in the Highlands it is called 'Mureck-baan,'—baan signifying the colour, which is white, and Mureck (it is probable) being the Celtic origin of the Latin Murex, the shell-fish which yielded the Tyrian dye or imperial purple." Mr. Norman confesses that his powers of imagination are at fault, and that he fails to see any connexion between *Murex trunculus* and "Mureck-baan." The variety *striata* attains a much larger size than the typical form; I have a specimen nearly an inch and a quarter long, an inch and a half broad, and more than three quarters of an inch thick. The young and fry of this species have the same constant characters as the adult.

It is the *M. stultorum* of Pennant and *M. lactea* of Poli (but neither of them Linné's species of those names), *M. triangula* of Renier, *M. cuneata* of Sowerby's 'Mineral Conchology,' *M. deltoides* of Lamarck, *M. Euxinica* of Krynicki (according to Middendorff), and the *M. obtruncata* and *M. triangulata* of Searles Wood. *M. lateralis*, Say (a common North-American shell), is probably a variety or offset of the same species.

B. Shell longitudinally rayed; lateral teeth and sockets smooth.

3. M. STULTO'RUM *, Linné.

M. stultorum, Linn. Syst. Nat. p. 1126; F. & H. i. p. 362, pl. xxii. f. 4, 6, and xxvi. f. 2.

BODY white faintly tinted with blue: *mantle* open throughout the ventral range, thickened at its edges, which are clothed with a delicate fringe of short intensely white filaments: *tubes* never exserted more than half an inch, covered with a slight and pale-brown wrinkled epidermis, which appears to be independent of that on the shell; orifices encircled by dingy pale-red unequal cirri, the alimentary tube having 12–16 (which are somewhat longer than the other set), and the excretal tube 16–20 of these appendages; the retractile valve of the last-mentioned tube is conspicuous: *gills* narrow and attached for two-thirds of their length, of the same proportionate size as in other species, and (as well as the *palps*) similarly striated: *foot* white, thick, and plastic.

SHELL of the same shape as *M. solida*, but more evenly convex and always ventricose, thin, although nearly opaque, and glossy: *sculpture*, numerous delicate and minute irregular concentric striæ, which are apparently formed by laminar folds of the epidermis and become somewhat coarser at the sides; occasional lines of growth are also observable: *colour* yellowish-white variegated by longitudinal rays of light reddish-brown, which are often confluent, or arranged in sets; purplish at the beaks; lines of growth represented by white bands or zones: *epidermis* yellowish-brown, laminar, and glistening, at the posterior end fibrous and frequently ramified or interlacing, so as to resemble some of the sessile kinds of *Tubulariidæ*: *margins* regularly curved in front, and obtusely angular at both ends, with a slightly rounded slope or deflexion on each of the dorsal sides from the beak to the terminal angles; the anterior and posterior sides are somewhat angulated, the latter more distinctly: *beaks* sharp, triangular, and incurved, turned a little towards the anterior side; umbones swollen and prominent, but not much projecting: *ligament* short and slight, yellowish-brown: *cartilage* triangular, compact, reddish-brown or chestnut, placed obliquely as in the other species: *hinge-line* curved: *hinge-plate* very broad, strong, and flexuous in consequence of the projection of the cartilage-pit and adjacent part: *teeth*, in the right valve a short, laminar, and erect cardinal, nearly parallel with the hinge-line, and another of the same description and height, placed at a right angle to the first, and forming one of the side-walls of the cartilage-pit; both these lie directly under the beak and on the anterior side; laterals two on each side, thin, erect, laminar, elongated, quite smooth and polished; the outer are shorter and smaller than the inner pair; in the left valve are two erect and laminar cardinals of equal size and height, united throughout at the back and diverging at a right angle, like the flaps of a single folding screen; this valve has also a thin, erect, laminar and elongated lateral on each side, which are higher in the middle and curve gradually to their bases: *inside* white, marked with clear specks, and minutely freckled, slightly striated in a longitudinal direction: *pallial scar* distinct, with a very short sinus representing an arc of three-fourths of a circle: *muscular scars* also distinct, irregularly oval and nearly equal-sized. L. 1·5. B. 2.

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* Fools'.

Var. *cinerea*. Shell rather more solid, ashy-grey or cream-colour, without rays. *M. cinerea*, Montagu, Test. Brit. Suppl. p. 35.

Habitat: From the verge of low-water mark at spring-tides to 18 fathoms (Goodwick Bay, Pembrokeshire), in sandy tracts; and the variety also is widely distributed. This species occurs, but not commonly, in all our upper tertiary strata from the Scotch glacial beds (Smith) to the Coralline Crag (S. Wood). Its extra-British habitat seems to be southern rather than northern. I observed specimens in the Royal Museum at Copenhagen from the Danish shores of the Baltic; it has been enumerated in every list of French, Lusitanian, Italian, and Algerian shells; Ehrenberg obtained it in the Red Sea, and Forbes in the Ægean; and M'Andrew dredged a single valve off the Canaries in 35 fathoms. The range of depth ascertained by the last-named observer on the coast of Portugal was from 15 to 30 fathoms. Brocchi and Philippi have recorded it as fossil in the newer tertiaries of Italy,—the one from the north, and the other from the south.

Lister discovered and figured this shell. According to Bouchard-Chantereaux its inhabitant serves for bait to catch whiting in the bays of Normandy. English fishes are not less fond of such savoury morsels, as may be inferred from the following note of Mr. Dennis:—"When the steam dredging-machines were at work at the mouth of Newhaven harbour last year [1861], they turned up so many of the *Mactra stultorum* that the beach at high-water mark (where a shell rarely occurs) was covered with them; and the trawl-fish, such as soles, &c., found their way to the spot where the barges were emptied, in such numbers that the Brighton trawlers or 'Hogboats' were most successful in capturing them within one hundred yards of the shore." He adds that "some of the people eat this *Mactra*." Shells of a smaller size, but thinner and more beautifully rayed than usual, were procured by Mr. Rich from the Silver-pit fishing-grounds, in about 30 fathoms. This is similar to the case of *M. solida*, var. *elliptica*, mentioned at p. 418. The largest specimens are found in Burra fiord in Unst.

The fry are oval and very tumid. *M. solida* resembles in form and size the variety *cinerea* of the present species; but, besides being flatter and thicker, it invariably has strong transverse grooves on each side of the beak.

I cannot think why Linné gave such an unpolite name to this species—unless it originated in a philosopher's joke, like that attributed to the derivation of *Assiminia*. It is the *Trigonella radiata* of Da Costa; and the variety is probably the *M. corallina* of Buonanni and Linné, and the *M. straminea* of Lamarck.

4. M. GLAU′CA*, Born.

M. glauca, Born, Test. Mus. Cæs. Vind. p. 51, t. 3. f. 11, 12. *M. helvacea*, F. & H. i. p. 366, pl. xxiii. f. 2.

BODY white, the posterior side and tubes being tinged with golden yellow: *mantle* delicately fringed with short flake-white filaments; edges projecting beyond the valves: *tubes* conical and rather short, extending about an inch, of equal length and diameter, streaked lengthwise with rufous-brown; orifices encircled with short and unequal cirri of the same colour.

SHELL triangularly oval, convex but not ventricose, expanded and gradually sloping from the umbones to the margins, thin for its size, and glossy under the epidermis: *sculpture*, numerous delicate and minute concentric striæ, as in *M. stultorum*, and occasional lines of growth: *colour* yellowish-white, variegated by longitudinal rays of yellowish-brown or fawncolour, arranged as in the last species, and of a brighter hue at the beaks, besides a large stain of chestnut on the dorsal margins: *epidermis* light brown, fibrous, glistening like fine satin in front and on the anterior side, coarser on the posterior side: *margins* scarcely (if at all) curved on the ventral side, and obliquely sloping backwards to the anterior end, which is rounded with a tendency to angularity, bluntly angular and much broader on the posterior side, where there is a considerable gape and an obscure ridge from the beak to the angular point in each valve; dorsal margins very gently curved on the anterior side and nearly straight on the other side: *beaks* sharp, triangular, and incurved, turned towards the anterior side; umbones swollen, prominent and projecting: *ligament* short and comparatively slight, reddish-brown: *cartilage* large, but not otherwise different from that of its congeners: *hinge-line* curved: *hinge-plate* extremely broad, reflected over the dorsal margins, strong, not flexuous because the cartilage-pit is scarcely advanced beyond the inner edge of the plate: *teeth*, in the right valve two short erect cardinals, united behind and diverging from each other at a right angle; laterals two on each side, and of the same description as in *M. stultorum*; in the left valve two united cardinals, and a single lateral on each side—similar to those in the last species, except as to size and in the laterals rising from the beak to a rounded point at each end and then abruptly falling and continued towards the front in a ridge-like form: *inside* coloured like the outside and showing the rays, slightly and irregularly striated in a longitudinal direction: *pallial scar* as in the last species: *muscular scars* triangularly oval, well marked. L. 3. B. 4.

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* Bluish-grey.

Var. *luteola*. Shell creamcolour, without rays but stained with reddish-brown or chestnut on the dorsal margins.

HABITAT: Confined to a very few parts of our southern shores, viz. Hayle, Cornwall, where single valves were first found by Miss Pocock, subsequently by Lieut.-General Bingham, and since by Mr. Templer, Mr. Jordan, and Mr. Hockin; Herm and Guernsey, at unusually low tides (Lukis). The variety is from Hayle. Fossil in the Red Crag (S. Wood); Tarenti (Philippi). The foreign localities are the north of France; Spain and Portugal (Chemnitz); Gulf of Lyons (Martin); and the Mediterranean, including Algiers (Poupillet).

A series of this handsome shell was presented to me by the late Dr. Lukis, who afterwards sent me an exquisite drawing of the animal, which has enabled me to give a description of that part. He observed that "when the tide recedes it buries itself two or three inches in the sand; and when the tide rises it bestirs itself like other mollusks, and reveals its hiding-place." Mr. G. H. King, of No. 190 Portland Road, lately kept a living specimen in one of his tanks, among other interesting things which this experienced naturalist dealer has exhibited to the public. Poli's description of the animal is very short:—margin of the mantle flattened and fringed; tubes rather long, united throughout, and cirrous; foot lanceolate. It goes by the name of "Schias" at Granville, and is sold in the fish-market at Brest.

Born described this species from a single valve, but accurately and unmistakeably. It was named by Chemnitz "Mactra helva seu helvacea"—scarcely a binominal appellation. He seems to have occasionally exercised a good deal of useless ingenuity in inventing new names, even when he was aware of those given by the discoverers. Thus we have seen that the *M. solida* of Linné became his *M. vulgaris*. The present species is the *M. Neapolitana* of Poli.

The *M. fragilis* of Chemnitz (*M. dealbata*, Pulteney, and *M. Braziliana*, Lamarck) is South American, and not British. Turton's specimen (a single valve) is so battered and antiquated that its exotic source may be safely taken for granted, with a mental reservation or doubt as to the correctness of his statement that it was "dredged in the Channel, near Guernsea."

Genus III. LUTRA'RIA *, Lamarck. Pl. VIII. f. 3.

Body elongated and somewhat cylindrical, compressed: *mantle* thick: *tubes* very long, united almost to their extremities and enclosed in one sheath; orifices fimbriated.

Shell oblong, very inequilateral, widely gaping at both ends, especially on the posterior side, slightly and concentrically striated: *beaks* turned towards the anterior side and separated: *teeth* as in *Mactra*, except that the laterals in the present genus are very small or rudimentary: *pallial scar* having a deep sinus.

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* Associated with the otter.

In comparing this genus with the last, we find that the siphonal tubes in *Lutraria* are extremely long; that the shell is large, oblong, very inequilateral, and gapes widely at each end; and that the lateral teeth are much less developed than in *Mactra*, and in one species altogether wanting. The *Lutrariæ* burrow deeply in mud near the shore.

Clark proposed to merge the present genus in *Mya*; and there has been much controversy as to its systematic position. It has certainly strong affinities both with *Mactra* and *Mya*. The last, however, has its mantle more closed, the tubes completely united, and a different kind of hinge-process.

1. Lutraria ellip'tica *, Lamarck.

L. elliptica, Lam. An. sans Vert. v. p. 468; F. & H. i. p. 370, pl. xii., and (animal) pl. H. f. 2.

Body white: *mantle* open only for one-third of its extent, margined by rather distant fine white filaments: *tubes* tapering; sheath between two and three times as long as the shell is broad, white towards its base, variegated in the middle with zigzag purplish-brown blotches, which at the top become distinct dots of a deeper hue; the surface of the sheath is also marked with two or three circular brown lines, an inch apart, and it is covered with a transparent corrugated skin, which appears to be an extension of the epidermis that clothes the shell; orifices of the tubes encircled by numerous white cirri minutely spotted with dark purplish-brown or red; the cirri of the alimentary tube are longer than the other set, and minutely ciliated at their sides: *gills* pale brown, not deep, the upper pair rather smaller than the lower; they are hung transversely, and finely pectinated: *palps* of a paler colour, long, triangular, pointed, of fine texture, and delicately striated: *foot* large, thick, and extensile.

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* Elliptical.

SHELL elliptical, compressed, moderately solid, and glossy: *sculpture*, irregular and slight concentric striæ alternating with stronger lines of growth: *colour* yellowish-white under the *epidermis*, which is olivaceous, glossy and like oilskin, wrinkled or puckered, delicately fibrous at the sides and in front, and minutely striated on the umbonal part in a longitudinally radiating direction: *margins* nearly straight or slightly indented and flexuous in front, and sloping obliquely to each side, the anterior being rounded or semioval and the posterior bluntly angulated; dorsal margins scarcely (if at all) curved, inclining forwards, and diverging from an obtuse angle: *beaks* small and sharp, incurved; umbones not much projecting: *ligament* small and short, greenish-brown: *cartilage* triangular and thick, narrower in the middle and spreading out at each end in the hinge-cavity, yellowish-horncolour: *hinge-line* nearly straight: *hinge-plate* long and strong, projecting in the middle to form a support for the cartilage: *teeth*, in the right valve two diverging cardinals on the anterior side, and a short slight and laminar lateral on the posterior side of the cartilage; in the left valve an erect and large double cardinal immediately below the beak, flanked by a smaller but pointed one (like a leaf) on the posterior side, and by a sharp triangular lateral on the anterior side, besides a slight laminar lateral on the posterior side, corresponding with that of the opposite valve: *inside* porcelain-white, polished and iridescent in the scar-marks, and microscopically wrinkled or frost-like in every other part: *pallial scar* double, with an oblong sinus extending about two-thirds of the distance across: *muscular scars* deep, placed high up near the dorsal margins, anterior pear-shaped, posterior triangularly oval. L. 3. B. 5·5.

Var. *alterutra*. Shell smaller, thicker, and proportionally broader; front and back margins nearly parallel, anterior side obliquely truncate.

HABITAT: Every part of our seas, from the lowest verge of spring-tides to 15 fathoms, in soft or slushy sand. The reason of this species being chiefly found in estuaries and at the mouths of rivers appears to be owing to an accumulation of mud being washed down from the land and deposited outside the line of mean tide-marks, which suits the *Lutraria* as a burrowing-bed. The variety has been found by Professor King on the coasts of Northumberland and Galway. *L. elliptica* is fossil in all our upper tertiaries from the Scotch glacial beds to the Coralline Crag; Subapennine strata (Brocchi); neighbourhood of Bordeaux (Lamarck); Sicily (Philippi). It is also recent in Finmark (Lilljeborg); Bergen (Sars); north of France (De Gerville and Bouchard-Chantereaux); shores of Spain and Portugal (M'Andrew); Algeria (Weinkauff); Sicily (Maravigna and Philippi).

Our earliest conchologist, Lister, discovered this species. It is edible in spite of its muddy habitation; for we are told by Mr. M'Andrew that it is sold in Vigo market; and Mr. Dennis says, "the Herm people eat every kind of shell-fish which is big enough; even *Lutraria elliptica* and *L. oblonga*—'Clumps' as they call them." The following observations by Montagu may be useful to those who are so devoted to conchology as not to object to turning mudlarks:—"It is rarely obtained alive, except by digging, and that only when the tide is unusually low: their place of concealment is generally known by a dimple on the surface, through which they eject water to a considerable height, though the shell is frequently buried two feet beneath." The shell is occasionally distorted, and varies in the proportion of length to breadth.

It is the *Mactra lutraria* of Linné, *Chama magna* of Da Costa, and *L. vulgaris* of Fleming.

2. L. OBLON'GA *, Chemnitz.

Mya oblonga. Chemn. Conch.-Cab. vi. p. 27. t. 2. f. 12. *L. oblonga*, F. & H. i. p. 374, pl. xiii. f. 1.

BODY pale yellow: *mantle* closed to the same extent as in the last species: *tubes* of unequal size; the alimentary (or

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* Oblong.

"branchial") one is much larger than the other, and its orifice is fringed with 30–40 fine cirri, one half of which are stronger and longer than the intermediate cirri and fimbriated on each side; the terminal cirri of the excretal tube are shorter and equal; tubular sheath covered with a brown epidermis: *gills* narrow, pale drab: *palps* very large, triangular, pointed, of a thin membranous texture, pale brown elegantly speckled with minute red-brown points: *foot* large, fleshy, and white with a tinge of pale brown.

SHELL scimitar-shaped, smaller than that of *L. elliptica*, much broader with respect to its length, more convex, cylindrical, and solid, upturned at the posterior end, which is rounded; the anterior side is considerably shorter in proportion; the cardinal tooth on the anterior side in the right valve is double, and there is no posterior lateral in either valve. L. 2. B. 4.

HABITAT: In similar situations, but not so generally diffused as the last species. It is rather common in the Channel Isles, and has been taken on the coasts of Dorset, Devon, Cornwall, and Ireland. It is said that the late Mr. Lyons found it in Pembrokeshire; and Mr. Maclaurin included it in his list of shells from Coldingham Bay, Berwickshire. Belfast "alluvial" deposit (Hyndman and Grainger); Sussex tertiaries (Godwin-Austen); Coralline Crag (coll. S. Wood in Brit. Mus.); Subapennine strata (Brocchi); Monte Mario near Rome (Lamarck); Sicily (Philippi). It has not been noticed anywhere north of Great Britain; but its distribution southwards extends from Normandy to Lisbon, Nice, and Algeria, its depth ranging from low-water mark to 12 fathoms.

Although this species comes very near the last, my iconoclastic propensities are not strong enough to unite them at present. If their form is variable, and not to be relied upon as a mark of distinction, the dentition of each is somewhat different. I am not aware whether they live together and under such circumstances retain their respective peculiarities. M'Andrew obtained both at Malaga—*L. elliptica* on the shore, and *L. oblonga* by the dredge, from 4 fathoms. In my cabinet is a curious malformation, the specimen having an inner case or double shell on the posterior side.

The present species is the *Mactra hians* of Pulteney, *L. solenoides* of Lamarck (but not of Capt. King), *M. hyans* of Turton's 'Conchological Dictionary,' *L. Solenoidea* of Brown, and probably *L. solida* of Philippi. Leach separated it from *L. elliptica* under the generic title of *Psammophila*.

Genus IV. SCROBICULA'RIA *, Schumacher.

Pl. VIII. f. 4.

Body oval, compressed: *mantle* open throughout the ventral range, somewhat thickened at its edges: *tubes* very long, separate, each covered with a membranous sheath or outer case; orifices usually plain: *gills* of equal size: *foot* long and flexible.

Shell triangularly oval or oblong, nearly equilateral, thin, of a uniform white colour, gaping at the posterior end, slightly and concentrically striated: *epidermis* slight and iridescent: *beaks* turned towards the posterior side, almost contiguous: *cartilage* placed obliquely: *teeth*, two small cardinals in the right valve, and one in the left valve, which is clasped by the opposite pair; laterals laminar, not always developed in both valves, and sometimes altogether wanting.

It is much more difficult to define this genus by a correct name than by comprehensive characters. Naturalists are perhaps over-fastidious in the former respect. I should have been glad to recognize the claim of priority put forward by Mr. Searles Wood for *Trigonella* (1778) if Da Costa's description would have justified my doing so; but it evidently applied to *Mactra* rather than to the group in question. Out of five species which Da Costa assigned to *Trigonella,* the first four are the only kinds of *Mactra* that appear to have been known to him; and as to the last (our *S. piperata*), he observes that "the hinge of this kind is of a different structure from the *Trigonellæ.*" Montagu's genus *Ligula* (1808) is the next in order of date; but his diagnosis was principally intended for *Thracia*; and the present genus was indicated only in the alternative, and insufficiently, viz. "in some species a minute erect tooth." He enumerated six species, arranged in two equal divisions: the first comprised all those of *Cochlodesma* and *Thracia* which he had discovered; and the second *S. piperata, S. tenuis,* and *S. alba,* to which he subsequently added *S. prismatica* and *Montacuta substriata,* although with some doubt as to the generic position of the last-named species. But at all events it would be inconvenient to have *Ligula* in the Mollusca, because the name was preoccupied by Bloch in 1782 for a genus of Entozoa, and (having been adopted by Rudolphi and others) is now constantly used in that department of zoology. *Arenaria* (1811) of Megerle von Mühlfeldt succeeds; and although it has been lately revived by Gray and Mörch, it is a Linnean and familiar botanical genus; and the current of scientific opinion seems to be against the double employment of any such name in natural history, if it can be avoided. I do not myself see any objection to the same generic name being used in *marine zoology* as well as in *land botany,* considering how wide apart are these great hemispheres of Nature, and the remoteness of the possibility that any practical inconvenience would ensue. However, Schumacher gives this as the sole reason for changing *Arenaria* into *Scrobicularia* (1817); and as the alteration has been sanctioned by Philippi, Forbes and Hanley, and (with a single exception) all the Continental zoologists, I will not prolong the discussion, beyond remarking that *Lavignonus* of Férussac (1821), *Listera* of Turton (1822), *Abra* of Risso from Leach's MS. (1826), and *Syndosmya* of Récluz (1846) either have never been clearly or adequately defined, or else are superfluous. The last-named genus has indeed been selected by Forbes and Hanley, and separated from *Scrobicularia*, without stating any particular character by which one can be distinguished from the other. Clark at first considered them different, on the ground that *S. piperata* has but one gill or branchial plate on each side, and that the palps are of a larger size in this than in some other species. He subsequently modified his opinion by suggesting that the single plate might be double: the relative magnitude of the labial palps can only be regarded by the mere malacologist as a matter of any importance. The sole diversity between the shells called *Scrobicularia* and *Syndosmya* consists in the former having no lateral teeth, while the latter possesses them in one or each valve. This character notoriously varies in species of other genera, for instance *Tellina* and *Donax*.

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* Having a little trench; so called from the shape of the cartilage-pit.

The circumstance of the tubes being separate in the present genus, and united in *Mactra* and *Lutraria*, might induce some conchologists to replace it among the *Tellinidæ*: but the hinge is essentially Mactridan; and in *Amphidesma*, which has the same internal structure, the tubes are also disunited. I should distrust any classification of families founded exclusively upon the contiguity or remoteness from each other of these outer folds or processes of the mantle called "tubes" or "siphons."

A. Lateral teeth more or less developed.

1. Scrobicularia prisma′tica *, Montagu.

Ligula prismatica, Mont. Test. Brit. Suppl. p. 23, t. 26. f. 3. *Syndosmya prismatica*, F. & H. i. p. 321, pl. xvii. f. 15.

Body pearl-white: *mantle* fringed with short and numerous cilia: *tubes* cylindrical and slender, indistinctly annular or corrugated by the investing sheaths; they are nearly of the same length, the incurrent being the larger or wider but usually the shorter of the two; excurrent or upper tube strangulated or constricted at irregular intervals; both tubes are clothed with a few scattered papillæ, and the orifice of each has from 5 to 7 short cirral points, which are sometimes obsolete or imperceptible: *gills* two on each side, suboval, of equal size, distinctly pectinated, faintly tinted with brown: *palps* the same in number, thin, short, broad, and angular, smooth without and striated within: *foot* large and pointed.

Shell oblong and wedge-shaped, scarcely convex, but not flattened except towards the posterior end, very thin and fragile, semitransparent, highly polished and glossy: *sculpture*, numerous slight, irregular, and minute concentric striæ, which occasionally are laminar or scratch-like, and towards the margins become partially oblique, as in *Tellina fabula*; the lines of growth are also more or less conspicuous: *colour* pearl-white: *epidermis* a mere film, reflecting in certain lights a prismatic lustre: *margins* curved in front, semioval or rounded on the anterior side, and bluntly pointed on the posterior side, which is flexuous and obtusely angulated; dorsal margin nearly straight on the anterior side, incurved below the beak, sloping outwards from the posterior angle, and obliquely truncate on that side, the point or terminal angle lying in the transverse axis of the shell: *beaks* very small; umbones somewhat projecting: *ligament* short, prominent, yellowish-brown: *cartilage* curved, horncolour, proceeding from a narrow chink under the beak, and expanding in a shelving and oblique direction below the hinge-plate on the posterior side: *hinge-line* obtusely angular and flexuous: *hinge-plate* rather thick, much broader and reflected behind the cartilage: *teeth*, in the right valve two minute, erect, equal-sized, parallel, and obliquely set cardinals, besides a long but slight lateral on each side, which are bluntly crested or pointed in the middle, the anterior lateral being longer than the other; in the left valve a minute erect cardinal which fits into those of the right valve; lateral teeth in this valve ridge-like and obscure: *inside* nacreous, minutely and irregularly striated towards the margin: *pallial scar* distinct; sinus rather long and tongue-shaped: *muscular scars* slight, of an irregular shape. L. 0·4. B. 0·8.

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* Having a prismatic lustre.

HABITAT: Sparingly distributed on all our sandy coasts, from the Shetland to the Channel Isles, in 3–87 fathoms. Fossil in the Clyde beds and Coralline Crag (Smith and Wood); Sicilian and Calabrian tertiaries (Philippi). It is extensively diffused both north and south, from Iceland (Steenstrup) to the Ægean (Forbes), at depths varying from 8 to 150 fathoms.

The animal is lively, and active by fits and starts—now and then darting out and twisting about on all sides its long and slender foot, as if for the purpose of burrowing. The shell, which is of an elegant shape, is frequently found in the stomachs of haddocks, as well as of the common plaice and other flat fish.

The *Erycina angulosa* of Bronn is probably identical with this species.

2. S. NI'TIDA *, Müller.

Mya nitida, Müll. Prodr. Zool. Dan. p. 245. *Syndosmya intermedia*. F. & H. i. p. 319, pl. xvii. f. 9, 10, and (animal) pl. K. f. 5.

BODY clear white: *mantle* fringed with numerous short cilia: *tubes* very long, closely annulated or marked across with slight rings of a dusky hue, resembling those in certain species of *Tubularia*; incurrent tube cylindrical; excurrent somewhat longer and tapering to a fine point; both are covered with a few scattered papillæ: *foot* large and extensile.

SHELL similar in many respects to that of *S. prismatica*, but longer in proportion to its breadth, so as to be rather oval than oblong: the surface has in front and at the sides very short delicate and scattered minute flocculent marks, apparently caused by an exfoliation of the epidermis: the ventral *margin* is more evenly curved; and the upper or dorsal margin on the posterior side has the same curve and angle of incidence as the lower posterior margin, both meeting halfway in a rounded and upturned point; the angle on this side is very indistinct; there is scarcely any depression below the beak on the posterior side, the dorsal margin being more expanded: the *cartilage* is golden-yellow and longer than in the other species, and the pit is larger and more twisted: the *inside* is lineated lengthwise, but is also microscopically fretted like shagreen: *muscular scars* conspicuous, the anterior being obliquely elliptical and the posterior triangularly eval. L. 0·45. B. 0·8.

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* Glossy.

Var. *ovata*. Shell more oval, often eroded near the beaks.

HABITAT: More local than *S. prismatica*, in muddy sand, at from 3 to nearly 100 fathoms: south coast of Cornwall (M'Andrew); Dogger bank (Howse and Mennell); all the coasts of Ireland; west of Scotland; and north and east of Shetland. The variety was taken by Barlee and myself while dredging together in Birterbuy Bay, co. Galway. Every writer on the Scandinavian mollusca has noticed its occurrence in those seas, at depths varying from 6 to 110 fathoms. The only southern locality recorded is Algeria, on the authority of M. Weinkauff.

The animal is quite as lively as its congener; but the shell gapes (or, for the sake of the antithesis, I may say, yawns) much more.

It is the *Amphidesma intermedia* of Thompson. If the recognition of the *Mya nitida* of Müller depended on the very obscure diagnosis in his 'Prodromus,' I should have felt the same disinclination as the authors of the 'British Mollusca' to accept the last-mentioned specific name; but an article by Fabricius, in the fourth volume of the 'Skrivter af Naturhistorie-Selskabet,' published at Copenhagen in 1798, has removed all doubt from my mind. It contains a full description of the species in question, which was communicated by Müller to his friend Fabricius; and I now give it with all faults. "Mya nitida. Long. 6. Lat. 3 lin. Testa extus intusque glaberrima, pellucida, lævis, nitida, absque striis candida, unicolor, subelliptica. Dens depressus obscurior, quasi antrorsum flexus in quovis cardine. Tellinam prima facie revocat, at testa hiat, nec dentes tres, nec alterum latus flexa est. In sinubus inter Christiansand et Arendal raro." The true teeth appear to have escaped Müller's observation; and no wonder, for they are exceedingly minute: what he called the "dens" must be the cartilage-pit. The *Mya nitida* of Fabricius is *Lyonsia Norvegica*; and it was in order to show the difference between his and Müller's shells of the same name that he introduced the description quoted above. I examined authentic specimens of Müller's *Mya nitida* in the collection of Fabricius at Copenhagen, and they are decidedly the present species. Lovén described it as *Syndosmya nitida*. It appears to be the *Scrobicularia tenuis* of Philippi, a Panormitan fossil.

3. S. AL'BA*, Wood.

Mactra alba, Wood, in Linn. Trans. vi. p. 165, t. xvi. f. 9–12. *Syndosmya alba*, F. & H. i. p. 316, pl. xvii. f. 12–14.

Body whitish, with a pale tint of sky-blue interspersed with flake-white spots: *mantle* thickened at its edges and fringed with very small whitish papillæ (according to Bouchard-Chantereaux these papillæ are arranged in three rows): *tubes* cylindrical, elastic in respect of both length and width; when fully extended they are as long as the shell is broad, and sometimes distended to three times their usual diameter; each is covered with a light-brown epidermis, and when half exserted they are strongly wrinkled; orifices plain: *gills* small, triangular, symmetrical, hanging obliquely: *palps* of the same size and shape as the gills, smooth outside and pectinated within: *foot* proportionally large, muscular, slightly angulated at the heel and granular at the point.

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* White.

Shell oval, rather convex, somewhat inequilateral, thin, opaque, polished: *sculpture*, numerous slight, irregular, and minute concentric striæ, crossed in some specimens (particularly towards the beaks) by fine longitudinal lines, which apparently pervade the whole fabric, as they are equally visible on the inside surface; the concentric striæ occasionally diverge obliquely near the margin, as in *S. prismatica*; lines of growth distinctly marked: *colour* snow-white, with an opaline hue: *epidermis* fibrous, pale yellowish-white: *margins* more or less curved in front, rounded on the anterior side, bluntly pointed on the posterior side, which is sometimes flexuous and slightly angulated; anterior dorsal margin gently sloping; posterior dorsal margin inclining from the beak at the same angle, and expanding outwards where it meets the posterior margin, so as to form a wedge-like edge; the terminal angle on that side is in a line with the transverse axis of the shell: *beaks* blunt and incurved; umbones projecting: *ligament* short, prominent, reddish-brown or horncolour: *cartilage* curved, dark reddish-brown, constructed and placed like that of *S. prismatica*: *hinge-line* obtusely angular: *hinge-plate* thick and strong, occupying about one-fourth of the circumference: *teeth*, in the right valve two minute erect cardinals on the anterior side of the beak, besides a triangular lateral on each side, the anterior one being double; the left valve has only a single small erect cardinal and a slight posterior lateral: *inside* nacreous and iridescent, finely and closely striated lengthwise and microscopically fretted; margin indistinctly crenulated: *pallial scar* having a short sinus of the same shape as the shell, occasionally double in consequence of a shifting of the base of the tubular fold: *muscular scars* usually shallow, anterior triangular and elongated, posterior nearly circular. L. 0·5. B. 0·8.

Var. 1. *radiata*. Shell of a thinner texture; posterior side marked with one or two clear rays. *Syndosmya radiata*, Lovén, Ind. Moll. Scand. p. 44.

Var. 2. *curta*. Shell contracted at each end and consequently more convex, rather solid; posterior side obliquely truncate and distinctly angulated.

HABITAT: Estuaries, creeks, and bays, gregarious in mud, from the low-water mark of spring tides to 40 fathoms. An odd valve was dredged by Capt. Beechey off the Mull of Galloway in 110–140 fathoms. Var. 1. Deal Voe, East Shetland, in 3 fathoms (J. G. J.). Var. 2. Lough Strangford (Waller); Larne, co. Antrim (J. G. J.). This species occurs in all our upper tertiaries, from the Clyde basin to the Coralline Crag; glacial beds at Uddevalla, and upper miocene strata at Biot in the south of France (J. G. J.); Panormi in Sicily (Philippi). It is common on all the Scandinavian coasts in 4–40 fathoms, and in other parts of the North-European seas from Boulogne to Lisbon in 7–30 fathoms, as well as throughout the Mediterranean and Ægean in 3–50 fathoms. The variety *radiata* was found by Lovén in the Bohuslän district, by Malm at a depth of from 3 to 6 fathoms in the estuary of the river Götha (where the water is brackish), and by Meyer and Möbius in Kiel Bay. A third and nearly transparent variety was taken alive by Forbes at the great depth of 80–185 fathoms in the Gulf of Macri, and described by him in the Reports of the British Association for 1843, under the name of *Ligula profundissima*; his typical specimens are preserved in the British Museum.

This little mollusk, although living in mud, takes care not to be smothered in it, but keeps up its communication with the sea. If, in dredging it, the contents of the net, mud and shells, are put into a tub and left for some hours to settle, the *S. alba* will be seen on the surface, having worked its way upwards by means of its muscular and flexible foot. It reminds me of an anecdote connected with the British Association. During the Southampton Meeting in 1847, Mr. M'Andrew treated some of the members to a dredging-cruise in his yacht. One haul yielded some of the present species, which is more frequently met with on the shore, thrown up by the waves, than fresh from its native haunts. When the dredge came up, the whole party rushed forward to see the result; and Baron Middendorff (the great Russian conchologist) in his eagerness nearly knocked down one of them. Stopping suddenly short, he took off his hat and made this apology for his unintentional rudeness—"Mille pardons, Monsieur! mais je suis enivré des coquilles." *S. alba* can not only burrow, but walk; and Bouchard-Chantereaux mentions his having watched them crawling up the sides of a phial filled with sea-water, in which he kept some specimens. Dr. Leach says that it is a favourite food of the cod. This shell attains a large size in the Shetland seas, being about an inch in breadth and of proportionate length. Its colour is always pure white, and uncontaminated by the mud with which it is in contact—the lustre being perhaps preserved by constant activity, as is the case with our own moral virtues:

> ". . . . . . . Persèverance, dear my lord,
> Keeps honour bright: to have done, is to hang
> Quite out of fashion, like a rusty mail
> In monumental mockery."

Its nearest ally is *S. nitida*; but that species is flatter and of a more delicate and fragile texture, the posterior side is elongated and produced to a more acute point, and the gape at that end is considerably wider.

It is the *Mactra Boysii* of Montagu, *Tellina pellucida* of Brocchi, *T. opalina* of Renier, *Amphidesma semidentata* of Scacchi (according to Philippi), *Erycina Renieri* of Bronn, *Abra fabalis* of S. Wood, and *Amphidesma Boysiana* of Leach.

4. S. TE′NUIS*, Montagu.

Mactra tenuis, Mont. Test. Brit. Suppl. p. 572, t. 17. f. 7. *Syndosmya tenuis*, F. & H. i. p. 323, pl. xvii. f. 11.

Body white: *mantle* having its edges delicately fringed: *tubes* cylindrical and narrow; the alimentary one capable of being extended twice the transverse admeasurement of the shell, the other usually recurved and shorter by one-third; orifices apparently plain: *foot* semitransparent, extremely flexible.

Shell rather triangular than oval, moderately convex, nearly equilateral, thin, opaque, generally not glossy although iridescent: *sculpture*, fine and close-set concentric striæ, the interstices of which are traversed by twice as many microscopical longitudinal striæ; lines of growth irregular but conspicuous: *colour* ashy-white: *epidermis* laminar, light yellowish-brown: *margins* gently curved in front, rounded on the anterior side, truncate and nearly straight on the posterior side, which is bluntly angulated and gapes a little; dorsal margins straight, and forming an angle of about 60 degrees with the beak as an apex, slightly excavated or depressed on both sides: *beaks* small and calyciform, inclining a little to the posterior side; umbones projecting: *ligament* minute and narrow, dark horn-colour: *cartilage* curved, yellowish-brown: *hinge-line* more rectangular than obtuse-angled: *hinge-plate* of moderate strength and thickness, occupying in the right valve about one-fourth, but in the left not one-tenth of the circumference: *teeth*, in the right valve two small erect and parallel cardinals, set (as usual) transversely to the hinge, besides one short double laminar lateral on the anterior side and a similar but single lateral on the posterior side; these laterals are triangular and rather abruptly truncate at their further extremities; the left valve has only one cardinal, similar to those in the right valve, and no lateral tooth (unless an obscure sunken fold or socket on each side of the hinge can be so called): *inside* somewhat nacreous, but not polished, indistinctly striated lengthwise, microscopically and closely freckled; margin bevelled and sharp: *pallial scar* well defined; sinus large and triangular, with its blunt apex below the beak, and its base parallel with the front margin: *muscular scars* rather deep, anterior oval, posterior trapezoidal. L. 0·3. B. 0·4.

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* Thin.

Habitat: Tidal estuaries and brackish water on the coasts of Devon, Dorset, Hants, Sussex, Kent, Guernsey, and Jersey, in mud at low tides; Scarborough (Bean); from the stomach of a wild-duck shot on Holy Island (Adamson); Seaton (Backhouse); Isle of Man, "in cavities of dead shells from deep water on the north coast" (Forbes); Lough Larne, co. Antrim (Thompson); Portmarnock, Dublin Bay (Rev. B. W. Adams). Perhaps some of the above localities may be questionable. Cherbourg (De Gerville); Portbail in that vicinity (Macé); shore of the lake, and living in 35 fathoms off the Gulf of Tunis (M'Andrew).

According to the late Dr. Lukis, who favoured me with a description and sketch in October 1859, the animal is active, and not very timid. I give his own account of it: "Arnold's pond contains the largest specimens of *S. tenuis*; and I discovered it in rather an unexpected manner, while sifting under the water of the pond the *ulvæ* and weeds in searching for a stock of *Rissoa labiosa*. The *R.* [*Hydrobia*] *ulvæ* also occurs there. I sifted the weeds at the time of nearly high tide, while the sea-water was rushing into the pond; and I imagine that the active *Syndosmya* was rising to the surface of the mud to imbibe the fresh stream from the sea, and thus became entangled in the weeds to be transferred to my sieve, an easy prey. I am not sure that they do not become the food of the grey mullet, considerable numbers of which live in the pond; for while I waded almost knee-deep, the fish played actively about me." In the last communication that I received from him (March 1863) he says, as to this species, "abundant in streams supplying the salt-works in Guernsey; also in the mud on the shore, in company with *Cylichna obtusa*, where there is an occasional afflux of brackish water. The former occur with *Rissoa* [*Hydrobia*] *ventrosa,* &c. In one large pond eels and minnows are associated with *S. tenuis*. The shell is apt to be stained in ferruginous clays."

It is probably the *Dorvillea Anglica* of Leach. The *Erycina ovata* of Philippi, from Lake Fusaro near Naples, is closely related to the present species: Deshayes named specimens of the former in the British Museum "*Scrobicularia piperita* jun."

B. Lateral teeth wanting.

5. S. PIPERA'TA*, Bellonius.

Mactra piperata, Linn. Syst. Nat. (ed. Gmelin) p. 3261. *Scrobicularia piperata,* F. & H. i. p. 326, pl. xv. f. 5, and (animal) pl. K. f. 6.

BODY pale yellowish-white: *mantle* bordered by a dark line, and having its edges irregularly scolloped and minutely fringed: *tubes* cylindrical, of nearly equal length, covered with a pale dirty-brown skin, tapering to their extremities, which are truncate and plain (but, according to Deshayes, the orifice of the excretal tube is finely ciliated, and that of the alimentary tube is plain): *gills,* one on each side, which is divided diagonally by a nearly central narrow groove into two subtriangular portions, so as to constitute a double plate; they are very thick, pale-yellow, placed obliquely, delicately pectinated outside but more strongly within: *palps* large, thin, flat, very long, triangular, broad above and pointed at their ends: these are coloured and striated like the gills: *foot* slightly bent, and white: *liver* dark-green, as in the other species.

SHELL triangularly oval, flattened, usually nearly equilateral, but sometimes more or less produced or elongated towards the posterior end, thin, opaque, lustreless except in young and fresh specimens: *sculpture,* numerous irregular concentric striæ and occasional marks of growth: *colour* greyish-white, often stained with yellow or black from the clayey or muddy habitat: *epidermis* slight, laminar or fibrous at the edges, glistening and partially iridescent: *margins* gently curved in front, rounded on the anterior side, truncate or bluntly angular on the posterior side, which is obscurely angulated and has a decided gape, nearly straight on each of the dorsal sides, which form by their junction with the beaks an angle of from 60 to 70 degrees: *beaks* very small and calyciform, inclining a very little, if at all, towards the posterior side; umbones projecting: *ligament* rather long and continued between the beaks to the anterior side, dark horncolour: *cartilage* large, bent like one of the knee-timbers of a ship, yellowish-brown: *hinge-line* obtuse-angled: *hinge-plate* thick, short, broad in the middle and tapering gradually to each side: *teeth*, in the right valve two thin, laminar, nearly parallel cardinals, the anterior being mostly higher but shorter than the other; in the left valve a straight laminar cardinal which is often double; the sides of the hinge-plate are callous or ridge-like, and serve the purpose of lateral teeth in keeping the hinge more securely closed: *inside* polished and somewhat nacreous, minutely and indistinctly striated lengthwise, and microscopically fretted like seal-skin; margin bevelled and sharp-edged: *pallial scar* distinct, with a large triangularly oval sinus, as in *S. tenuis*, but having the upper angle more rounded: *muscular scars* rather deep, of an irregular shape, anterior oblong, posterior trapezoidal. L. 1·5. B. 2.

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* Peppery

HABITAT: Beds of mud and clay, at low-water mark, and as deep as 4 fathoms seawards, on all our shores from Exmouth (Clark) to Aberdeen (Macgillivray), as well as in Ireland and the west of Scotland: it is gregarious. Fossil in a raised sea-bed at Swansea discovered in the course of excavating the South Docks (Moggridge); similar deposit at Belfast (Hyndman and Grainger); York and Forth beds (Smith); Sussex tertiaries (Godwin-Austen). Scandinavian coasts from Bergen to Kiel Bay, France from Boulogne to Nice, Vigo and Malaga, Algeria, Spezzia, Naples, and Sicily.

The name of this species may have been derived from the peculiar flavour of the animal. Montagu says that it has an extremely bitter taste—although the old proverb occurs to one's mind when we learn from Capellini that at Spezzia it is sought for as an article of food and sold with other shell-fish. According to Clark this kind is called a "mud-hen" by the fishermen at Exmouth. They burrow in stiff clay, six inches or more, each individual making and occupying its own hole, and forming together a honeycombing commonwealth. The breadth of the shell being two inches, the length of the siphons must be at least twice as great, in order to keep the hole clear and have access to the water. Bouchard-Chantereaux has remarked that *S. piperata* also requires or prefers to breathe pure air; for during the recess of the tide the orifice of the lower tube is considerably dilated, and when it is placed in a vessel of water, this tube is gradually stretched out so as to reach the surface, and remains for some hours in that position. *Pholas* has the same habit. The earliest account we have of the animal of the present species is that by Réaumur, published in the 'Mémoires de l'Académie' for 1710; and it has lately been described by Bouchard-Chantereaux, Quoy, Philippi, Deshayes, Forbes and Hanley, and Clark. I have had the benefit of collating these descriptions with my own notes made in 1836. Its anatomy has been elaborated by Deshayes, and illustrated by twenty-two finely-coloured plates, in one of the Appendices to the 'Exploration scientifique d'Algérie.' The remarkable structure of the hinge, typical of this genus, did not escape the observant eye of Lister. The young of *S. piperata* has probably been mistaken for *S. tenuis*; but it is much flatter and broader, and wants laminar teeth. Some distorted specimens, which I found in peat, are contracted, and consequently more convex than usual.

It is "La Calcinelle" of Adanson, *Trigonella plana* of Da Costa, *Venus borealis* of Pennant (but not of Linné), *Mya hispanica* of Chemnitz, *Mactra Listeri* and *Mya* *gaditana* (as well as *Mactra piperata*) of Gmelin, *Mactra compressa* of Pulteney, *Mya orbiculata* of Spengler, *Solen callosus* of Olivi (according to Philippi), *Scrobicularia arenaria* of Schumacher, *Lavigno calcinella* of Récluz, and *Trigonella Listeriana* of Leach. The young is the *Amphidesma tenue* of Macgillivray.

Candid Reader, contrast the superficial aphorism of Pope,

> "The proper study of mankind is man,"

with the following lines by Wordsworth, which embody a far greater depth of thought and acquaintance with Nature, and are strictly in unison with those feelings which arise from the prosecution of such studies as the present:—

> "Happy is he who lives to understand,
> Not human nature only, but explores
> All natures,—to the end that he may find
> The law that governs each; and where begins
> The union, the partition where, that makes
> Kind and degree, among all visible beings;
> The constitutions, powers, and faculties
> Which they inherit—cannot step beyond—
> And cannot fall beneath; that do assign
> To every class its station and its office,
> Through all the mighty commonwealth of things;
> Up from the creeping plant to sovereign Man.
> Such converse, if directed by a meek,
> Sincere, and humble spirit, teaches love:
> For knowledge is delight; and such delight
> Breeds love: yet, suited as it rather is
> To thought and to the climbing intellect,
> It teaches less to love, than to adore;
> If that be not indeed the highest love!"

TABLE of geographical and geological distribution, framed on the principles set forth in the preceding volume, with respect to the Land and Freshwater Mollusca of Great Britain.

Species.	Northern.	Southern.	Upper Tertiary.	Extra-European localities
Brachiopoda.				
Terebratula cranium	—			
caput-serpentis	—	—	—	North America and Japan.
Argiope decollata		—		Madeira and the Canaries.
cistellula	—	—	—	
capsula	—			
Crania anomala	—	—		Algeria.
6	5	4	2	
Conchifera.				
Anomia ephippium	—	—	—	North America, Algeria, and Madeira.
patelliformis	—	—	—	Sitka Sound, North-west America, and Algeria.
Ostrea edulis	—	—	—	New York.
Pecten pusio	—	—	—	Azores.
varius	—	—	—	Algeria.
opercularis	—	—	—	Madeira and Algeria.
septemradiatus	—	—	—	
tigrinus	—	—	—	
Testæ	—	—		Algeria.
striatus	—	—		
similis	—	—	—	
maximus	—	—	—	Canaries.
Lima Sarsii	—			
elliptica	—			
subauriculata	—	—	—	Canaries.
Loscombii	—	—	—	North Africa.
hians	—	—	—	Canaries, Madeira, and Azores.
Avicula hirundo		—	—	North Africa, Canaries, Madeira, and Azores.
Pinna rudis	—	—	—	North Africa and Canaries.
Mytilus edulis	—	—	—	North America and Morocco.
modiolus	—		—	Behring's Straits and New England.
barbatus		—	—	Algeria.

Species.	Northern.	Southern.	Upper Tertiary.	Extra-European localities.
Conchifera (*continued*).				
Mytilus Adriaticus	—	—	—	Gulf of Tunis.
phaseolinus	—	—	—	
Modiolaria marmorata	—	—	—	Canaries.
costulata		—	—	Canaries.
discors	—	—	—	North Greenland and New England.
nigra	—		—	North America.
Crenella rhombea		—	—	
decussata	—		—	Greenland and New England.
Nucula sulcata	—	—	—	
nucleus	—	—	—	North Africa.
nitida	—	—	—	Greenland and Algiers.
tenuis	—		—	North America.
Leda pygmæa	—	—	—	
minuta	—		—	Massachusetts.
Limopsis aurita			—	
Pectunculus glycymeris	—	—	—	Madeira and Canaries.
Arca pectunculoides	—	—	—	Greenland.
obliqua	—	—		
lactea		—	—	Canaries.
tetragona	—	—	—	Canaries and Azores.
Galeomma Turtoni		—		
Lepton squamosum	—	—	—	
nitidum	—	—	—	
sulcatulum		—		Canaries.
Clarkiæ				
Montacuta substriata	—	—	—	
bidentata	—	—	—	
ferruginosa	—	—	—	
Lasæa rubra	—	—	—	Gulf of California, Canaries, and South-west America.
Kellia suborbicularis	—	—	—	California and Canaries.
Loripes lacteus	—	—		Canaries.
divaricatus	—	—	—	Madeira and Canaries.
Lucina spinifera	—	—		Canaries.
borealis	—	—	—	North America.
Axinus flexuosus	—	—	—	Greenland, Massachusetts, and Canaries.
Croulinensis				
ferruginosus	—	—	—	Greenland.
Diplodonta rotundata	—	—	—	Madeira and Canaries.
Cyamium minutum	—	—	—	Greenland.
Cardium aculeatum	—	—	—	
echinatum	—	—	—	Greenland, Madeira, and Canaries.
tuberculatum	—	—	—	Madeira and Canaries.
papillosum		—		Canaries.

Species.	Northern.	Southern.	Upper Tertiary.	Extra-European localities.
Conchifera (*continued*).				
Cardium exiguum	—	—	—	Algeria.
fasciatum	—	—	—	North Africa, Canaries, and Azores.
nodosum	—	—	—	
edule	—	—	—	Aral Sea and Caspian.
minimum	—	—	—	
Norvegicum	—	—	—	Madeira and Canaries.
Isocardia cor	—	—	—	
Cyprina Islandica	—		—	North America.
Astarte sulcata	—	—	—	North America, North Africa, and Canaries.
compressa	—		—	North America.
triangularis		—	—	Canaries.
Circe minima	—	—	—	Madeira and Canaries.
Venus exoleta	—	—	—	
lincta	—	—	—	North Africa.
Chione	—	—	—	North Africa and Azores.
fasciata	—	—	—	
Casina	—	—	—	Algeria, Madeira, and Canaries.
verrucosa	—	—	—	Canaries.
ovata	—	—	—	
Gallina	—	—	—	North Africa.
Tapes aureus	—	—	—	
virgineus	—	—	—	
pullastra	—	—	—	
decussatus	—	—	—	Senegal and Indian Ocean?
Lucinopsis undata	—	—	—	Mogador.
Gastrana fragilis	—	—	—	North Africa.
Tellina balaustina		—	—	North Africa, Madeira, and Canaries.
crassa	—	—	—	Gulf of Tunis.
balthica	—	—	—	Behring's Straits, Kamtschatka, and North America.
tenuis	—	—	—	Mogador.
fabula	—	—	—	Algeria.
squalida	—	—	—	Madeira, Canaries, and Azores.
donacina	—	—	—	Madeira.
pusilla	—			
Psammobia tellinella	—	—	—	
costulata	—	—	—	North Africa, Madeira, and Canaries.
Ferröensis	—	—	—	North Africa and Canaries.
vespertina	—	—	—	North Africa and Canaries.
Donax vittatus	—	—	—	
trunculus	—	—	—	North Africa.
politus	—	—	—	Algiers.

Species.	Northern.	Southern.	Upper Tertiary.	Extra-European localities.
Conchifera (*continued*).				
Amphidesma castaneum ..	—	—		Madeira, Canaries, and Azores.
Mactra solida	—	—	—	
subtruncata	—	—	—	North Africa.
stultorum	—	—	—	Algeria and Canaries.
glauca	—	—	—	Algiers.
Lutraria elliptica	—	—	—	Algeria.
oblonga	—	—	—	Algeria.
Scrobicularia prismatica ..	—	—	—	
nitida	—			Algeria ?
alba	—	—	—	North Africa.
tenuis	—			Gulf of Tunis.
piperata	—	—	—	Algeria.
124	110	107	104	

Of the above species 96 are both northern and southern, 14 are exclusively northern, and 9 exclusively southern—although all the species described in this volume are in one sense northern, considering Great Britain to be within that line of distribution. Five other species (viz. *Rhynchonella psittacea, Pecten Islandicus, Astarte crebricostata* or *depressa, A. borealis,* and *Tellina calcarea*) formerly existed within the area of our seas, and are included in catalogues of the British mollusca; but they have never been discovered otherwise than in a fossil state. These last are arctic, as well as the *Leda limatula* of Say and a few more species which occur in glacial deposits. The upper tertiary species comprise 7 exclusively northern, and the same number exclusively southern, as well as one species which is not known as recent except in Shetland; the rest are common to both divisions.

ERRATA.

Page 133, line 12 from top, for "*C. decussatus*" read "*C. decussata.*"
,, 264, line 13 from top, for "*trunculus*" read "*vittatus.*"
,, 280, line 6 from bottom, *for* "variatal" *read* "varietal."
,, 349, line 11 from top, for "*striatula*" read "*gallina.*"
,, 357, line 13 from top, for "*elliptica*, var. *oblonga*" read "*oblonga.*"
,, 390, line 2 from top, for "*Hypothyris*" read "*Rhynchonella.*"
,, 402, line 17 from top, the word "types" should not be in italics.

INDEX TO VOL. II.

The synonyms, as well as the names of spurious species, and of species, genera, and other groups which are not described in this volume, are in italics.—The figures in smaller type refer to the page in which the description of species, genera, and higher groups will be found.

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EXPLANATION OF PLATES.

FRONTISPIECE.

Pinna rudis.

PLATE I.

Fig. 1. *Terebratula caput-serpentis.*
1^{a}. *T. cranium.*
2. *Argiope cistellula.*
Fig. 3. *Crania anomala.*
4. *Anomia ephippium.*
5. *Ostrea edulis.*

PLATE II.

Fig. 1. *Pecten opercularis.*
1^{a}. *P. similis.*
2. *Lima Loscombii.*
Fig. 2^{a}. *Lima hians.*
3. *Avicula hirundo.*

PLATE III.

Fig. 1. *Pinna rudis.*
2. *Mytilus edulis.*
3. *Modiolaria marmorata.*
Fig. 3^{a}. *Modiolaria nigra.*
4. *Crenella decussata.*

PLATE IV.

Fig. 1. *Nucula nucleus.*
2. *Leda minuta.*
3. *Limopsis aurita.*
4. *Pectunculus glycymeris.*
Fig. 5. *Arca lactea.*
5^{a}. *A. tetragona.*
6. *Galeomma Turtoni.*
7. *Lepton squamosum.*

PLATE V.

Fig. 1. *Montacuta bidentata.*
2. *Lasæa rubra.*
3. *Kellia suborbicularis.*
4. *Loripes lacteus.*
5. *Lucina borealis.*
Fig. 6. *Axinus flexuosus.*
7. *Diplodonta rotundata.*
8. *Cyamium minutum.*
9. *Cardum edule.*

PLATE VI.

Fig. 1. *Isocardia cor.*
2. *Cyprina Islandica.*
3. *Astarte sulcata.*
Fig. 4. *Circe minima.*
5. *Venus fasciata.*
6. *Tapes virgineus.*

PLATE VII.

Fig. 1. *Lucinopsis undata.*
2. *Gastrana fragilis.*
3. *Tellina balthica.*
Fig. 4. *Psammobia tellinella.*
5. *Donax vittatus.*

PLATE VIII.

Fig. 1. *Amphidesma castaneum.*
2. *Mactra solida.*
Fig. 3. *Lutraria elliptica.*
4. *Scrobicularia piperata.*

THE END.

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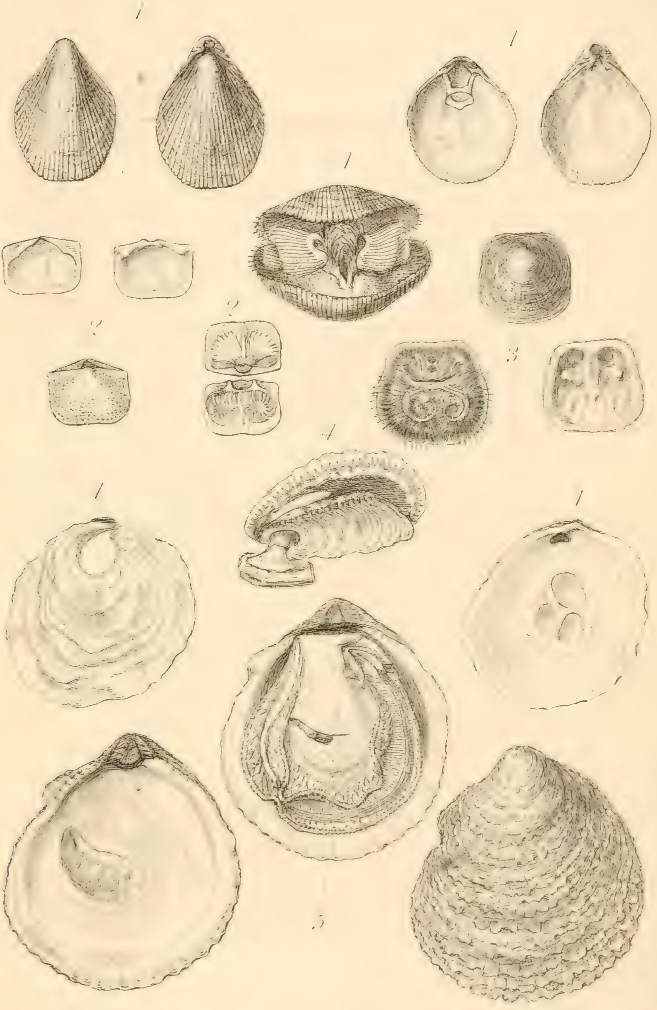
Plate I.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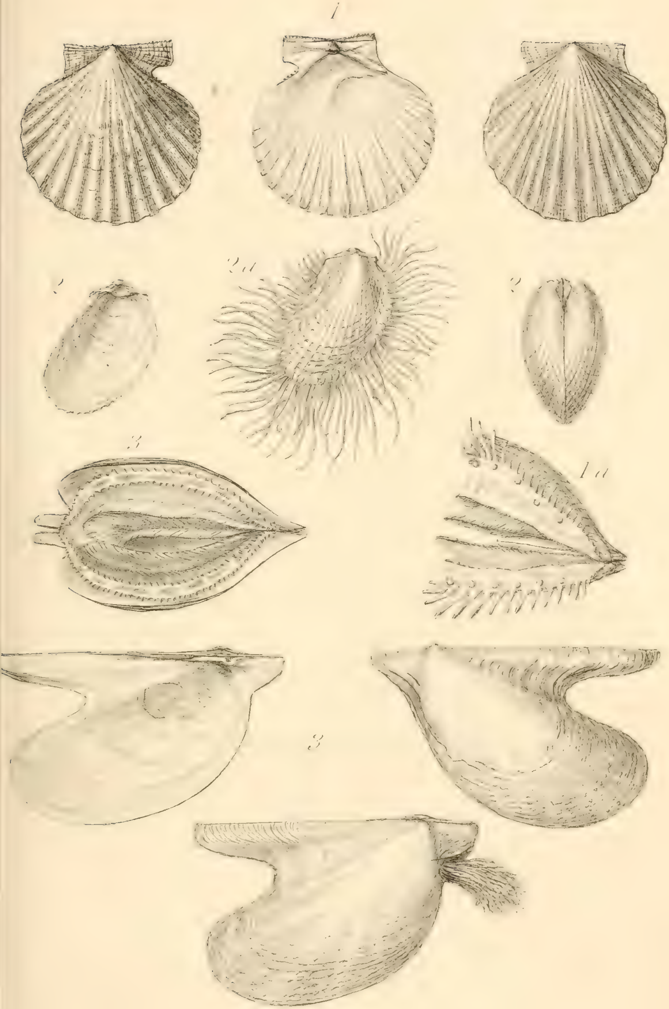
5

1. *Terebratula.* 2. *Argiope.* 3. *Crania.*
4. *Anomia.* 5 *Ostrea.*

W. Sowerby sc.

Pub. by Van Voorst 1864.

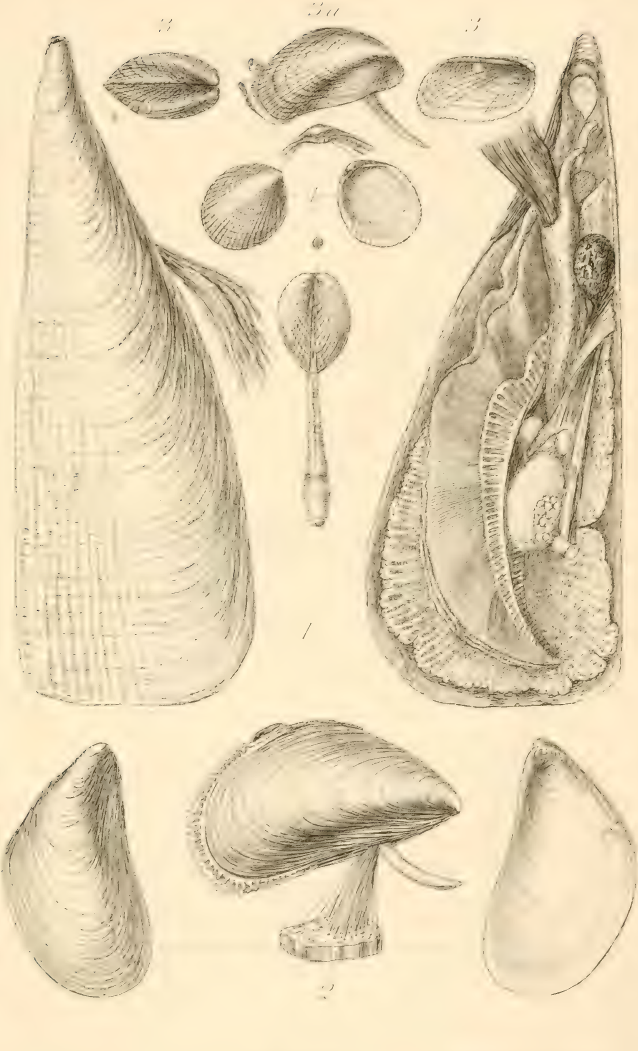
Plate II. Vol. 2.



1. *Pecten.* 2. *Lima.* 3. *Avicula.*

W. Sowerby sc.

Pub. by Van Voorst 1864.

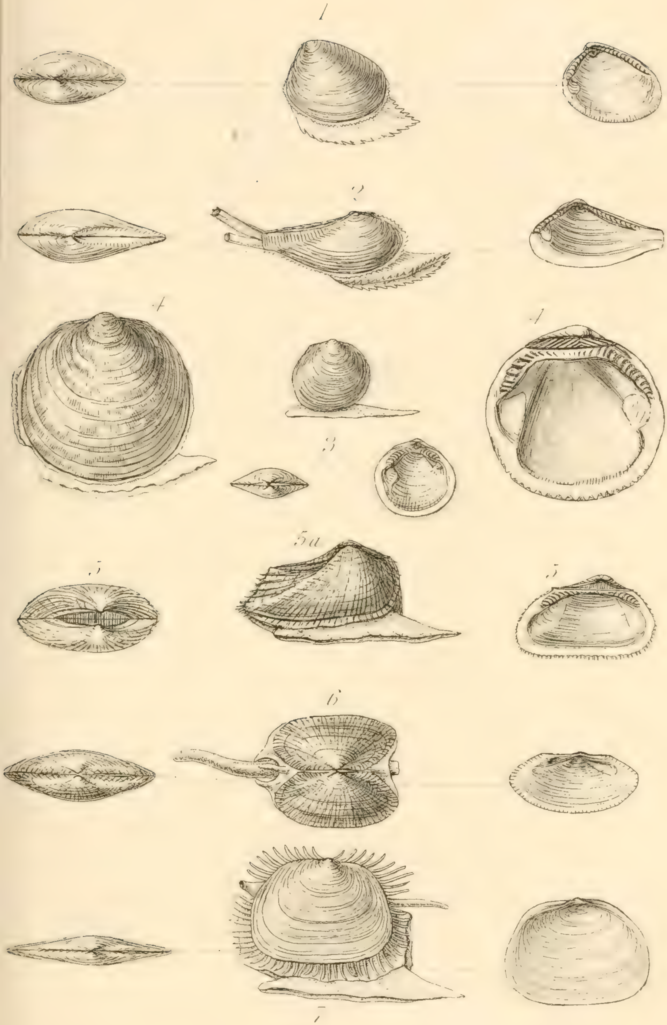


1. Pinna. *2. Mytilus.* *3. Modiolaria.*
4. Crenella.

G.B.Sowerby sc.

Pub. by Van Voorst 1864.

Plate IV.


1
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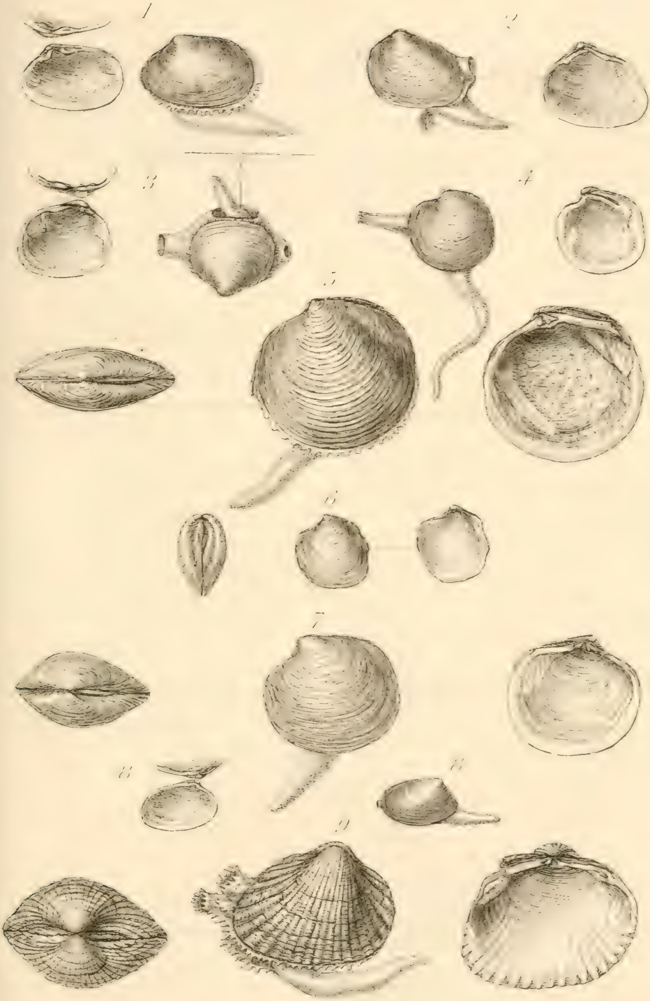
1. *Nucula.* 2. *Leda.* 3. *Limopsis.*
4. *Pectunculus.* 5 *Arca.* 6. *Galeomma.* 7. *Lepton.*

Plate V.

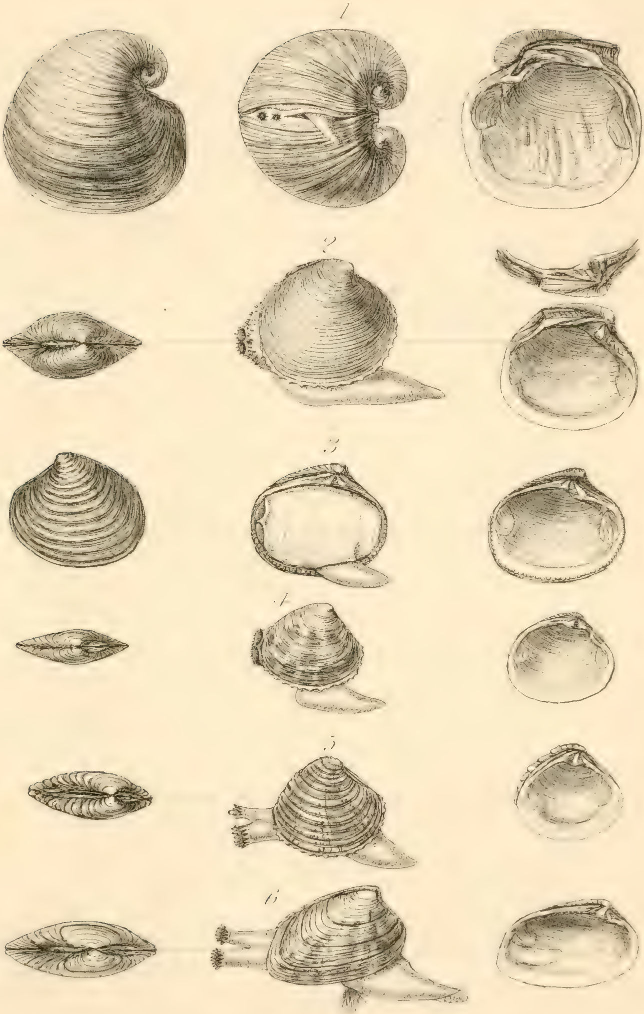


1. *Montacuta* 2. *Lasæa* 3. *Kellia*
4. *Loripes.* 5. *Lucina.* 6. *Axinus*
7. *Diplodonta* 8. *Cyamium.* 9. *Cardium*

W. Sowerby

Pub. by Van Voorst, 1864.

Plate VI.

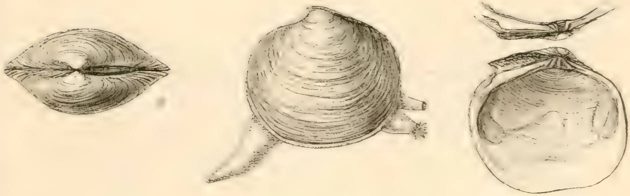


1. *Isocardia.* 2. *Cyprina* 3. *Astarte*
4. *Circe.* 5. *Venus* 6. *Tapes*

Pub. by Van Voorst, 1864.

Plate VII. Vol.2.

1



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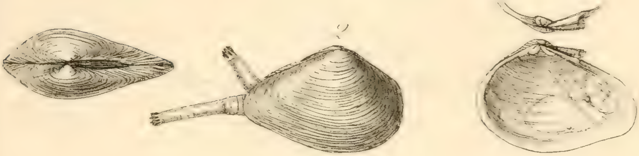

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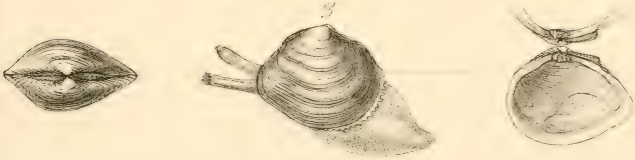

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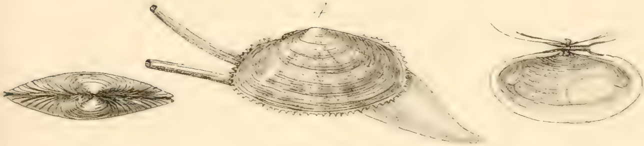

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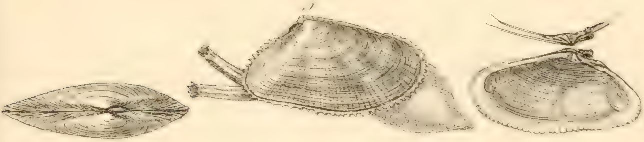
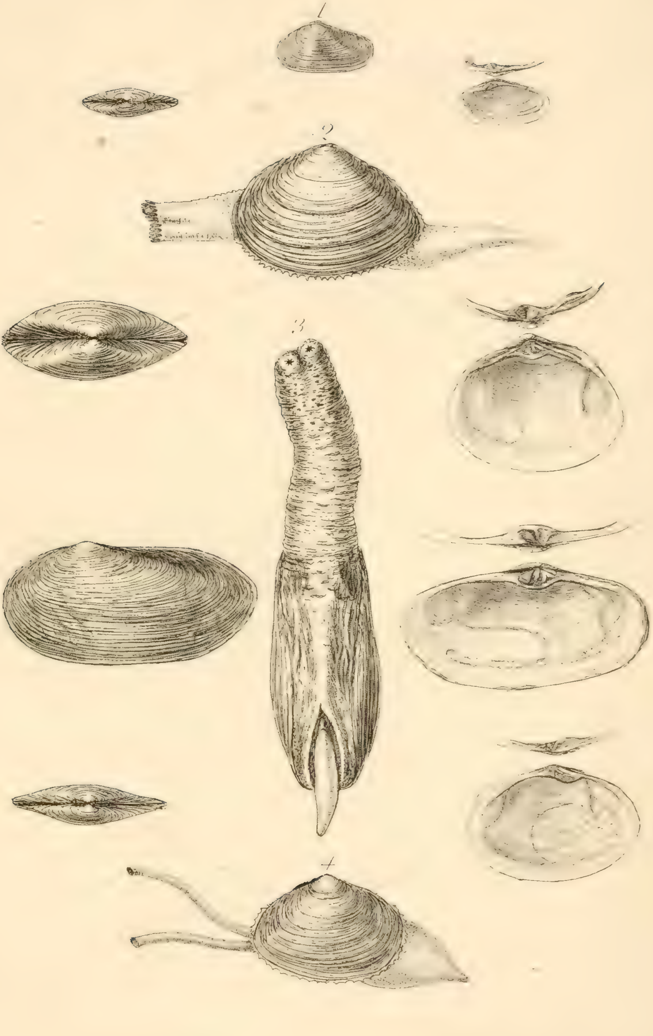


1. *Lucinopsis.* 2. *Gastrana* 3. *Tellina*

4 *Psammobia* 5. *Donax*

W.Sow

Plate VIII.



1. *Amphidesma.* 2. *Mactra*
3. *Lutraria.* 4. *Scrobicularia*

T. Sowerby sc.

Pub. by Van Voorst, 1864

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